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LPG MARKET ASSESSMENT STUDY FOR MOZAMBIQUE

JUNE 2005
This publication was produced for review by the United States Agency for International Development. It was prepared by Nexant, Inc. under Contract No. EPP-I-00-03-00007-00

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In association with:
M S R C O N S U L T O R I A E M P R E S A R I A L L T D A.
Rua Voluntários Da Pátria, 45 / 305 - CEP 22270-010
Botafogo - RJ - RJ - Brasil - Tel/Fax (5521) 2535-5226

CHISOMO MATHEWS CHILEMBA
Predio Medimoc, No. 500, Av. Julius Nyerere 2 Esq., Polana Cimento
Maputo, Mozambique

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Section 1 Introduction and Overview

In Mozambique, biomass fuels such as firewood and charcoal account for 80-90% of the energy supply, and in the northern province of Cabo Delgado, the percentage is even greater. 16,000,000 cubic meters of wood are burned in Mozambique each year to satisfy the country's energy needs. Pressure is particularly acute in more populous coastal areas, such as in Cabo Delgado, where over six square kilometers of mangroves are being cut every year to meet the growing demand for fuel.

Deforestation and soil erosion exacerbated the level of devastation in Mozambique during the 2000 floods, which left thousands dead and cost millions of dollars in rescue and restoration efforts. Mangrove destruction is eliminating the breeding grounds for economically important prawns and other fishes, the harvesting of which constitutes one of the primary economic activities in coastal areas. Mangroves also protect Mozambique's coral reefs, which are one of the primary attractions driving the rapidly growing tourism industry in Mozambique.

The severe health, economic and environmental implications of deforestation and burning of biomass fuels make it critical to promote household switching to cleaner, more environmentally sustainable fuels such as liquefied petroleum gas (LPG).

1.1 OVERVIEW

LPG was not widely available in Cabo Delgado until VidaGas, a Mozambique-based for-profit company, opened an LPG plant in the provincial capital of Pemba. Two NGOs, - VillageReach and its Mozambican partner, the Foundation for Community Development (FDC) – established VidaGas to support a healthcare project in this province. VidaGas initially supplied the Mozambique Ministry of Health with LPG for powering essential equipment in health facilities, and later expanded its supply to other customers including restaurants, tourist lodges and hotels in or near Pemba, and to a commercial prawn operation. VidaGas now wishes to target households and small and medium enterprise (SMEs), mainly in the barrios, or residential urban and peri-urban sections of the city. VidaGas has thus begun to establish a retail network, including several urban and rural retailers, and recently opened a store centrally located in the city. In addition to LPG and storage canisters, VidaGas offers a range of LPG-powered appliances including lamps, cookers, refrigerators, freezers, and sterilizers.

Despite the current availability of LPG in Pemba and some remote villages, uptake by low to middle-income urban and rural residents and SMEs has been slow. A number of challenges remain, including cultural habits of using charcoal for cooking, unfamiliarity with LPG, the wider availability of biomass fuels, the relatively high cost of LPG and equipment, and inadequate training of retailers of LPG and accessories.

This project was undertaken to understand the barriers to expanding the LPG market in Pemba, and to develop appropriate strategies to promote switching to LPG. This report describes the activities undertaken and the outcomes of this technical assistance.

1.2 OBJECTIVES OF TECHNICAL ASSISTANCE

The ***primary objective*** of this technical assistance is to develop a program to support expanded LPG use in households and SMEs in the urban and peri-urban areas (or barrios) of Pemba, a township in the Cabo Delgado Province of Mozambique.

1.3 SCOPE OF WORK

The scope of work for this project included conducting customer market surveys in the city of Pemba in Northern Mozambique and making an assessment of the LPG market and its structure in Mozambique and in Pemba, in particular.

Focus group meetings were conducted among customers and traders to understand their energy needs and concerns about fuels used for cooking. The outcome of these focus group meetings guided the development of survey instruments that were used in the market survey of target populations groups in Pemba. The study team also visited Mozambique to study and understand the dynamics of the LPG market. The data and information gained during this visit and the findings from the market surveys were used to make an assessment of the market for LPG and to develop a strategy to expand LPG service to target customers in Pemba.

The following tasks were conducted:

- Focus group meetings among target stakeholder groups including customers, charcoal and firewood vendors, and small food retailers. Four focus group meetings were conducted
- General assessment of the LPG market in Mozambique
- Assessment of the LPG market in Pemba and present retail marketing strategies for distributing LPG.
- Market surveys among target stakeholder groups including customers, fuel traders and food vendors. A total of 500 surveys were completed.
- General assessment of the LPG market in Pemba and development of a strategy to expand the market for LPG services in Northern Mozambique.

1.4 THE STUDY TEAM

The study was conducted by a team of consultants from the USA, Mozambique and Brazil. Nexant as the lead USAID contractor led the team of consultants. The consultant team comprised the following individuals:

- Mr. Anand Subbiah, Nexant, Energy expert and project manager, USA
- Mr. Marcos Reis, LPG expert, Brazil
- Mr. Ademir Carvalho, LPG expert, Brazil
- Mr. Chisomo Chilemba, Market survey expert, Mozambique
- Ms. Bakondja Muundjua, Market survey assistant, Mozambique
- Mr. Sam Davies, Discussion guides and recruitment, Mozambique

- Mr. Bento Vasco, Focus group facilitator, Mozambique
- Mr. Reis Muando, Translation and transcription, Mozambique
- Mr. Ernesto Milissão, Focus group coordinator & participant recruitment, Mozambique
- Mr. Kevin Abraham, Database Specialist, South Africa

Section 2 Mozambique – Macroeconomic Outlook

2.1 GENERAL DEMOGRAPHIC AND ECONOMIC DATA

As a precursor to understanding the dynamics of the marketplace for fuels in Pemba, Mozambique, it is useful to examine the general macroeconomic data for the country and for the Pemba region. This background provides perspective to the challenge posed by the objective to increase penetration of LPG in the marketplace.

The Republic of Mozambique is located in the South Eastern coastal part of Africa, covering a large territory of about 800,000 km2, with an estimated population of 19,420,036 inhabitants with 48.2% male and 51.2% female inhabitants (2005 data). The average population growth rate is about 2.5% per year.

The local currency is the Metical (MT). Over the period 1998 to 2003, the currency lost over half its value in relation to the dollar. Since 2004, there has been a slow recovery in the value of the currency and as of the 1st of January 2005 one dollar was equivalent to 19,360 Metical. *This drop in the value of the currency has important implications for the use of non-traditional fuels such as LPG, which are more expensive compared to charcoal and firewood, which have traditionally been used in households especially in the poorer Provinces of the country.*

The country is divided into 10 provinces, which contains 23 cities and towns and 68 villages (Appendix 1). The road and railroad infrastructure is weak and land connections between the Capital, Maputo, in the South and Pemba in the North are poor. It is estimated that some 60-70% of the roads are in unpaved or in very poor condition, and only about 10% of the road network is paved and in good condition. The rail network is also poor and there exists only one railroad from Maputo to Zimbabwe, the country neighbor to its West.

The communications system is also precarious, covering only a small part of business and households. For instance, even in the Capital Maputo, the fixed telephones system covers only 30% of business and households. This coverage drops to about 5% for the rest of the country. But following recent global trends, the cell phones system is building fast and has a market share of 30% in Maputo and 10% in the rest of the country.

The weak transport and communications infrastructure again has important implications for the sale and pricing of higher-priced fuels such as LPG.

2.2 GROSS NATIONAL PRODUCT AND GNP PER CAPITA

The GNP of Mozambique has increased in 1996 constant prices from 40,932,044 in 1998 to 59,549,366 million Meticals in 2003 at an annual rate of about 7.8%, which is a very respectable growth rate. Considering the population growth rate of about 2-2.5%, the effective growth rate is about 5.0% per year. If this sustained over the next 10 years, the per capita GNP would increase to about US$ 500.00.

Even this forecast per capita GNP is too low to support the development of large-scale LPG distribution networks in the interior of the country.

Thus alternative sources like charcoal and firewood will continue to play an important role in the Mozambique energy matrix, as they are cheaper and easier to find for the majority of the population, especially in the hinterlands.

2.3 MAJOR ECONOMIC ACTIVITIES

Agriculture, commerce, industry and transportation are the main economic activities that account for two-thirds of the GNP. Almost all of the industrial products are manufactured through transformation of agricultural, fishing and other similar products.

Tourism in Mozambique is still at an incipient stage and hotel occupancy rates are low. The majority of this tourist and business traffic is concentrated in the province of Maputo. The city of Maputo alone has accounted for some 40% of the registered movement of domestic guests and 75% of people from abroad (2001 & 2002 data). During the same period, the Province of Cabo Delgado had registered only 3-4% of domestic and 1-2% of guests from abroad.

The weak industrial and commercial structure does not present a huge market potential for higher-priced fuels and may inhibit the growth of large-scale development of LPG infrastructure in the country.

Section 3 LPG Market in Mozambique

The LPG market in Mozambique is still at an incipient stage with a total market size of some 13,500 tons per year in 2004. Given Mozambique's population of some 18.5 million people, the per capita consumption of LPG is an abysmal 0.73 kg per year[1].

3.1 LPG CONSUMPTION

According to information provided by IMOPETRO, the total consumption of LPG in Mozambique was as follows:

Year	Tons	Average per month	Rate of growth %
2001	8,000	667	
2002	8,700	725	8.7
2003	10,100	842	16.1
2004 (Jan-Nov)	12,500	1,137	35.0

Annual sales in 2004 are projected to be about 13,500 ton. It is estimated that some 80% of LPG is consumed in the urban areas of Maputo, where the per capita income is far higher than the rest of the country. Thus while the national average per capita consumption of LPG is very low, the data is in fact very skewed; the per capita consumption in urban Maputo is very much higher (about 5.4 kg per year). The consumption in the smaller towns and rural areas is abysmally low due to the very low income and the fact that high LPG transportation costs makes LPG more expensive in areas distant from Maputo.

Presently about 90% of all LPG is consumed in the domestic sector and in hotels and restaurants. The industrial sector accounts for only about 10% of the total consumption. Based on the growth rate over the past few years, it is probable that the demand for LPG could double over the next 5 years. This trend could be sustained and increased with a concerted effort to improve sales of LPG in smaller provinces and towns.

The 1991 statistics shows that only 6.6% of the families (households) were equipped with LPG stoves. The recently completed market survey in Pemba indicates that in higher income households (with monthly income of over $1,500 per year) some 24% of households have a gas stove. The absence of income stratified census data in Mozambique makes it difficult to estimate the potential for LPG in the domestic sector. It is estimated that some 10% of households in Mozambique have annual income of over $1,500 per year. At an estimated consumption of 5.5 kg per month among households that can afford to use LPG, the potential consumption of LPG in this small segment of households alone could be about 22,000 tons per year.

[1] In 1995, for example, the annual per capita LPG consumption in South Africa was 6.4 kg, in Gabon it was 12.1 kg, 69.2 kg in Algeria, and 22.3 kg in Egypt

Thus there is a huge untapped potential even among customers who can afford to purchase LPG. If LPG transportation costs are reduced, and the product is aggressively marketed among all customer sectors, the potential for LPG would be much higher.

3.2 LPG SECTOR LEGISLATION AND RULES

Mozambique has no specific legislations governing the storage, bottling, handling, distribution and use of LPG. Though the market for LPG is presently very small and may not warrant a regulatory body to monitor its supply and use, there is a need for an institutional and legal framework with the capacity to monitor and supervise the activities of the entities operating in the sector. If the country is serious about developing its LPG market, it is critical that the LPG companies in the country work with the Government to develop rules and regulations to regulate and govern all aspects of supply and use. The development of a regulatory framework and benchmarks is fundamental to create and establish parameters of safety and product quality, covering the many steps of distribution process, as well as for customer protection.

The absence of regulatory guidelines has given rise to some unacceptable practices as observed in the filling station. Also, new and second hand equipment and cylinders can be imported with impunity with no concern for quality. There are practically no rules governing the start-up of a new LPG company; all that is required to obtain formal government authorization for a new LPG company in the country is that the company demonstrate that it has storage capacity, which it can readily obtain by obtaining a throughput contract with PETROMOC (the Mozambican state-owned oil company) or by becoming an associate of IMOPETRO (the private company that imports fuels and operates as an industry association.)

Proper guidelines and regulations will crate the right atmosphere and provide incentives for companies operating in the country to increase their level of investment and, as a consequence, to develop the LPG market.

The Energy Strategy for Mozambique (Resolution No. 24/2000 of October 3, 2000) does intend to promote the use of LPG and improve its availability in all areas of the country. It also states the government's intention to promote the extraction and production of LPG form natural gas, and encourage the participation of new operators in LPG distribution.

3.3 LPG SUPPLIES AND LOGISTICS

There is no LPG production in Mozambique. LPG supplies come from South Africa where it is produced in a natural gas separation plant, which processes natural gas produced in Mozambique and piped through a 2,000-km long pipeline. LPG is transported from South Africa back to Mozambique by railroad and lower capacity tankers.

In Mozambique the delivery and primary throughput is the responsibility of a pool-operated company, IMOPETRO, which acts as a coordinator of all LPG imports from South Africa. IMOPETRO operates as a cooperative on behalf of its members and does not make any profit from its operations[2]. IMOPETRO ensures supply of LPG primarily through tankers though

[2] The association IMOPETRO and it services are fashioned after a similar model that has been successfully operating in Brazil for the last 30 years.

railroad and road supplies are sometimes necessary to meet unexpected variations in demand and tankers delays.

IMOPETRO uses the throughput facilities of the former refinery of Mozambique, where production was stopped in 1986. The old refinery's storage capacity of 1,100 tons of LPG is adequate to support the next years' projected growth. IMOPETRO has developed plans for the reception, storage and deliveries of LPG to companies in Maputo. But considering that South Africa is not in a position to meet the growing LPG demand of Mozambique due to its own internal requirements, meeting future demand will also be contingent on alternative suppliers of LPG and reliable means of transportation.

VidaGas is supplied LPG in 9 tons capacity containers from PETROMOC, which has limited storage capacity of about 200 tons. This is unlike other LPG companies that receive LPG through pipelines. Since VidaGas operated primarily in the province of Cabo Delgado, the LPG has to be then shipped from Maputo to Pemba in containers.

3.4 LPG PRICE STRUCTURE

The price of LPG at the port in Maputo – CIF Maputo – is about $223 per metric ton, which is slightly lower than international average prices[3]. Present legislation requires that the price of LPG gas be the same at the 3 harbors – Maputo, Biera and Pemba. This is quite untenable given the high costs of transporting LPG from Maputo to say Pemba, a distance of some 2,500 km. This has limited the interest of the LPG companies to actively seek markets outside of Maputo.

While the bulk price for the LPG imported from South Africa is fixed on an annual basis and is presently at US$ 223.00 per ton, the price to the final customer is quite high given the high transportation costs. The breakdown of LPG prices in Mozambique is described below.

A mark up of US$ 15.00 per ton is added to cover IMOPETRO's operational costs increasing the basic price to US$ 238.00 per ton. From this starting point the equation used to calculate the final prices is:

CIF Maputo + on-shore Pool cost + Access freight + Margin = Final Price

An exception is made for the Maputo city market where the price are fixed by the Federal Government and includes IVA – value added tax. The prices in the interior of the country are not controlled. In Maputo area the price structure is as follows:

Cost Component	US$/ton
CIF Maputo price	238
Distribution margin	282
Dealers FOB price	520
Primary distribution cost	28
Dealers CIF price	548
Dealer's margin	97

[3] reference Mont Belvieu; the industry reference for LPG prices.

Customer's price	645
45.0 kg cylinder price	29.0
11.0 kg cylinder price	7.1
5.5 kg cylinder price	3.55

The above analysis of costs illustrates that LPG is a very expensive fuel in Mozambique where the per capita income is less than $300. In distant provinces, prices are higher still due to the added transportation costs, and the need to compensate for the low volumes of sales with higher margins to meet fixed costs. There is thus a need to exploring options to lower costs.

3.5 COMPETITORS AND MARKET SHARE

The main companies in Mozambique's LPG market are:

MOÇACOR: They are the largest LPG company and the main competitor in the country, with a market share of about 67%. The company is linked to PETROGAL of Portugal. The company operates primarily in the cities of Maputo and Beira though it is present in many of the country's provinces. Distributing a volume of about 7,000 tons per year, the Company has a market share twice that of PETROGAS, the second largest LPG firm in Mozambique. The filling plant and storage facilities of about 200-ton capacity are located in the city of Maputo.

PETROGÁS: This company comes second to MOCACOR and primarily operated in Maputo though it too operates in many provinces. Controlled by the South African group AFROX, the company has a 27% market share. It is presently in the process of closing its operations in Pemba due to the poor acceptance of its 11-kg capacity cylinders. The filling plant is located in Maputo.

GULP: This is a small Company controlled by MOÇACOR, and operates with LPG supplied by the holding company. They sell 11-kg LPG cylinders in Pemba through their petrol stations. The LPG filling plant is located in Beira, about 1,500 km North of Maputo.

VIDAGAS: A company operating primarily in Pemba in the Northern Province of Cabo Delgado. The company ships LPG in bulk from Maputo to the port in Pemba, and operates a filling station in Pemba to fill LPG cylinders.

3.6 ALTERNATIVE SOURCES OF ENERGY

The primary alternative sources of energy in Mozambique are:

Charcoal: Together with firewood, charcoal is the fuel used by over 70% of the population. In many of the smaller towns and provinces, households using LPG also use charcoal for some of their cooking needs. The price paid in Maputo for a small bag of charcoal – weighing about 2 kg – is about US$ 1.00. Typically, households that are a target for switching to LPG, spend about $7.00 per month on charcoal (if the household were to switch to LPG, based on an average consumption of one cylinder per month, the cost of LPG would be $8 per month).

Firewood: Firewood is generally used by very poor people or by some commercial establishments that bake traditional breads and make local beer.

Electricity: Is the used throughout the country though it is reliably available only in large cities and towns. Electricity is generally not used for cooking because of its relatively high cost.

Kerosene: Kerosene is primarily used in poor households for lighting.

Paraffin: Mainly used for illumination in poor households as fuel for small lamps.

Natural Gas: Natural gas is a new entrant in the energy market in Mozambique. Its distribution started only in 2004. The gas is produced in the country and them pumped to South Africa where LPG and gasoline are separated in refineries and the resulting dry gas (methane or a mixture of methane and ethane) is pumped back to Maputo for local distribution.

Section 4 Province of Cabo Delgado – Macroeconomic Outlook

4.1 GENERAL DEMOGRAPHIC AND ECONOMIC DATA

The Cabo Delgado province is located in the extreme north of Mozambique, at a distance of about 2,700 km from Maputo by road, and covers a geographic area of 78,655 km^2. The province has a population of 1,526,000 inhabitants (2002 data).

The Province of Cabo Delgado is divided in 17 Districts (Appendix 2). The provincial capital is Pemba; a city of 117,243 inhabitants (2002 data). The other important town in the area is Montepuez, with a population of about 56,433 inhabitants, according to the 1997 census. In addition to the above cities, the province has other major urban centers, which are smaller but include 5 towns with population over 20,000 inhabitants, 3 between 10,000 and 20,000 and only one below 10,000.

Statistics for 2002 show a rate of illiteracy of about 77.0% in the area, with only 20% of the population speaking Portuguese. The average life expectancy is of 42.2 years. The 1997 census also shows that indicators of quality of life are very low. Piped water is provided to only 3.5% of households, followed by sewage treatment and electricity, which is provided to 1.3% and 1.7% of households, respectively. There has not been any significant improvement in the provision of these services since then, though it is reported that hydroelectric power is now being made available to some cities in the Province, including Pemba.

4.2 GROSS NATIONAL PRODUCT AND GNP PER CAPITA

The provincial GNP is about US$148,000,000 (2002 data). The per capita GNP is very low at just US$ 97.00 per year.

The population on average is poor with poor access to public health, education and other social services. The economy is basically one of subsistence and in the informal sector.

4.3 ECONOMIC ACTIVITIES

Agricultural, cattle raising and fisheries are the primary economic activities. The production and distribution of charcoal is also an important economic activity. Industry and services sector contribute little to the GNP. Agriculture contributes almost 50% to the GNP, while manufacturing industry and services account for only 2.7% and 8.1%, respectively.

Almost all of manufacturing industry is dedicated to the transformation of agricultural and fishing products and to natural raw materials like wood and forests derivatives.

Section 5 LPG Market in Cabo Delgado

5.1 LPG CONSUMPTION

The local LPG market is still at a nascent stage of development and LPG consumption is estimated at about 15-20 tons per month.

The stock of cylinders in the province is about 200 of 45 kg capacity (168 VidaGas); 1050 of 5.5 kg (1000 VidaGas); and 400 of 11 kg, the majority of which are the property of GULP (VidaGas has recently added some 11 kg cylinders).

Sales of LPG are primarily to the industrial sectors, hotels, restaurants, and a small segment of the domestic sector. Of course, the health sector, which was the driver for the provision of LPG to the area, is still an important consumption sector. The company sells about 250 5.5-kg cylinders per month, 40-50 11-kg cylinders, and about 125 45-kg cylinders. The 5.5-kg cylinders are sold primarily to households and SMEs, and the 45-kg cylinder to the industrial client and large commercial clients such as Pemba beach hotel.

Given the low average income of the local population, it is challenging to increase the market share of what is perceived to be an expensive product. Especially so, when the use of charcoal and firewood is widespread. Some of key factors to increasing sales volume are: reduction of logistics and supply costs of LPG; reliable system of LPG supply; development of new LPG uses; and Increased earning among the local population. One option to expanding the use of LPG is to perhaps introduce credit facilities for the development of local commerce and industry based on the expanded use of LPG appliances.

5.2 LOGISTICS AND SUPPLIES

Supply of LPG to the region is primarily through two modes of transport: the shipping of 9-ton capacity containers from Maputo to the port in Pemba; and transportation by road of 11 kg capacity cylinders, filled in Beira.

Transport the 9-ton container from Maputo to Pemba costs US$ 2,500 in freight and an additional US$ 500 to return the empty container. The high logistics cost of supplying LPG to the region leads to high cost of supply. Add to this the cost of US$ 70/ton to cover port and other costs, and the delivered cost of LPG goes up by about US$ 407/ton. This results in a selling price that is incompatible with the local levels of income.

Other forms of transport would not necessarily make it any cheaper. Transporting LPG in 18-ton capacity tankers by road from Maputo to Cabo Delgado would cost about US$ 7,600 leading to a delivered cost of US$ 422/ton. The transport cost of LPG in cylinders is higher still. GULP transports 350 11-kg capacity cylinders at a cost of about US$ 520/ton.

5.3 PRICE STRUCTURE

The price of LPG in Cabo Degado is highly influenced by the freight costs as mentioned above. The retail prices of LPG in the province are not controlled and are exempt from tax. The price structure of LPG delivered to the region is as follows:

Cost Component	US$/ton
FOB Maputo price	238
Maputo to Pemba freight cost	407
Price CIF4 Pemba	645
Distribution margin	650
Price to Dealer	1,295
Dealer's margin	155
Customer's price	1,450
45.0 kg cylinder price	65.00
11.0 kg cylinder price	16.00
5.5 kg cylinder price	8.00

Thus the actual delivered price of a 5.5kg capacity cylinder in Pemba is twice that in Maputo and is higher than the average monthly per capita GNP for the Province, which is just over $8.

5.4 COMPETITORS AND MARKET SHARE

VidaGas is the primary supplier of LPG in Pemba. Other in the marketplace include GULP, which sells 11-kg cylinders though its petrol station outlets, and Petrogas; though Petrogas is in the process of moving out of the market place.

5.5 LPG APPLIANCES CURRENTLY IN USE

The LPG appliances commonly used in Pemba are:

- Freezers and Refrigerators used at the Health centers, and industrial and commercial establishments.
- Gas Cooking ranges and ovens in restaurants
- Four-burner stove with LPG or electric oven operated with 45-kg capacity cylinders. The cost of such a stove is about US$ 1,000 and clearly not affordable by most of the population. As a matter of fact only four households in Pemba have this type of gas stove.
- Three-burner stove without oven operated with 11-kg cylinders, which cost about US$ 375.
- Four-burner stove without an oven operated with 5.5-kg cylinders, which costs about US$ 100.

[4] CIF – cost, insurance, freight.

- Two-burner stove operated with 5.5-kg cylinders, which cost about US$ 20.
- One-burner small stove, also called “kit VidaGas”, sold for about US$ 9.00.
- LPG-operated lamps for illumination

Section 6 LPG Market Survey

6.1 FOCUS GROUP MEETINGS

The main objectives of the qualitative and quantitative surveys and analysis were to gain insights into:

- Peoples' general purchasing behavior and decision factors
- The most commonly used fuels for cooking, heating and illumination
- Factors that influence fuel purchase decisions
- Peoples' attitudes towards their health and the environment
- Overall perceptions about LPG

The research methodology comprised four exploratory focus group sessions involving mixed groups of 40 adults mostly from the lower-middle and low-income families. Each session was facilitated by an experienced moderator to ensure that participants understood the nature of the issues being discussed as well as to facilitate an atmosphere that fully encouraged the participants to express themselves. Each focus group meeting was recorded on video for transcription and report writing purposes. The information gathered during these sessions was used to provide the key themes for the design of the quantitative survey instruments.

The Sample Frame

The participants comprised individuals aged between 18 and 50 years who live within the confines of the bairros/informal residential areas in Pemba and who primarily depend on non-electrical sources of power for heating, illumination and cooking purposes. As outlined below, each focus group comprised ten carefully screened and selected participants to represent the views of their peers in the categories sought for this study, namely:

- Group 1: People involved in the household's cooking or fuel purchasing activities
- Group 2: People involved in the household's key expenditure and decision-making
- Group 3: Small scale informal sector charcoal and firewood traders
- Group 4: Small-scale retailers engaged in pre-cooked food sales

The rationale for selecting the above groups was based on their ability to provide useful insights about how these people make fuel choices, what fuels they use, factors that influence their choices and how they value different types of fuel.

6.1.1 Design of the Discussion Guide

In order to direct the discourse in the focus groups sessions, a discussion guide was designed. The discussion guide contained questions aimed at answering the research objectives as outlined above and permitted new and unforeseen topics to be addressed.

Given that the four focus groups were designed to capture the distinct views of ordinary consumers and those of small scale local retailers, a modified version of the original discussion guide was used for the retailer groups; in addition to the original set of consumption behavior questions, the modified discussion guide sought to understand what led these participants into the retail trade, the challenges they faced and some of the strategies they employed to continue in that line of business.

6.1.2 Scope and Limitations

Due to time and budgetary constraints, the participant recruitment process was restricted to residents of Pemba. While it is true that the study's findings are based on a small sample with somewhat skewed characteristics (Pemba is one of the countries poorest cities) that might limit its applicability to other regions of the country, the sample was large enough to provide valuable insights about some prevalent attitudes that people who primarily depend on non-electrical sources of power have towards different fuel types.

6.2 MARKET SURVEYS

A customer market survey was carried out among 400 households in Pemba the capital city of the Northern Mozambican province of Cabo Delgado to assess and understand the dynamics of the market for LPG. The survey was designed to gain insights into the factors that influence people's attitudes towards the fuels they use for cooking, illumination and heating. The survey instrument used for consumers is provided in Appendix 3.

A separate survey among 100 fuel traders and food vendors was also conducted. This survey provides insights into considerations that are important for fuel vendors to market LPG. The survey instrument used for fuel traders and food vendors is provided in Appendix 4.

The basis for the design of both survey instruments was the outcome of the focus group meeting previously conducted among target customer groups that included customers and traders/vendors.

The results of the surveys will help in understanding the market for LPG and designing appropriate awareness campaigns and marketing strategies to increase the penetration of LPG in the marketplace.

6.3 CUSTOMER MARKET SURVEYS

6.3.1 The Sample Frame

A market survey was conducted through 400 household interviews with consumers aged between 18 and 50 years. The household sample was split such that 120 interviews were conducted in the urban (typically cement construction) part of town, and 280 in the peri-urban/outskirt neighborhoods. By design, there was close to an even split between number of female and male respondents. This was done to ensure that the survey captured the different perspectives presented by users of fuels, purchasers of fuels and heads of households.

The areas covered by the survey included the following neighborhoods:

Bairro Cimento in the urban/cement part of town, and

Bairrros de Ingonane, Paqutequete, Natitte, Cariacó, Alto Gingone, Nanhimbe and Chuiba (all located in the peri-urban/outskirt neighbourhoods)[5].

There are no accurate census figures and limited demographic and other data to indicate the purchasing power and distribution of households in Pemba and the local fuels market. The sample for the survey was thus based on the findings of the focus group meetings, the surveyor's previous market research experiences and knowledge of the market. The surveys are deliberately weighted and skewed in favor of respondents that were more likely to be informed about the fuel products and market under consideration, i.e., households with income of $25 per month and higher. Obviously, these households are representative of only a small segment of Pemba's population (about 10%)[6]. Households with income lower than $25 per month clearly cannot afford to switch to LPG, and it is only households that have an income of at least $100 per month or more that is the target population for fuel switching.

The surveys provide valuable insights about fuel use patterns in Pemba, considerations that influence fuel purchase, consumer attitudes towards LPG and their willingness to pay. Much of these insights are not only valuable within the context of the study area but could also be applicable to other parts of Mozambique and its neighboring countries.

6.4 CUSTOMER MARKET SURVEY RESULTS

6.4.1 Demographics

Table 6.1 below provides the marital status of the respondents, which indicates that over half the respondents were married, or living with a partner.

Table 6.1 Marital Status of Survey Respondents

Marital Status of Respondents	Percent Gender of Respondents		
	Female	Male	Total
Divorced	4%	1%	2%
Married/Live with Partner	57%	46%	52%
Single	34%	48%	41%
Widowed	5%	5%	5%

Table 6.2 shows the age distribution of the surveyed population. Over 60% of respondents were under the age of 34, which, as an effect of the random sample, might well reflect the actual demographics of the population base of Pemba.

5 The peri-urban areas are not the same as rural areas. These are the equivalent of shantytowns located within the vicinities of the urban area and often within 5 to ten minute walking distances from it. These are the areas where houses here are generally built of inferior construction material.

6 The remaining population is largely made up of seasonal subsistence farmers who live under conditions of extreme poverty.

Table 6.2 Age Distribution of Survey Respondents

Age of Respondent Years			
	Female	Male	Total
18 to 25	30%	36%	33%
26 to 34	35%	20%	28%
35 to 44	14%	24%	19%
45 to 54	14%	13%	13%
55 to 64	8%	6%	7%
65 plus	1%	2%	1%

Table 6.3 below shows the occupation of the surveyed population for female and male respondents. The levels of employment for women are low with some 46% indicating that they are housewives or unemployed. Among male respondents the corresponding figure is lower at 37%.

Table 6.3 Occupation of Survey Respondents

Female		Male	
Occupation	Percent	Occupation	Percent
Housewife	41%	Student	33%
Student	24%	Teacher	5%
Teacher	6%	Unemployed	4%
Unemployed	5%	Trader	3%
Trader	3%	Retired	3%
Nurse	3%	Own Business	3%
Peasant	2%	Fisherman	3%
Accountant	2%	Accountant	2%
Technician	2%	Technician	2%
Admin. Assistant	2%	Doctor	2%
Other/no response	10%	Other/no response	40%

Figure 6.1 below shows appliance ownership among the surveyed population. The survey indicates that some 7% have a gas cooking range and 24% a gas stove compared with 17% who have electric cooking ranges and 29% who own electric stoves. Firewood stoves are owned by 23% of the population and almost everyone (90%) owns a coal stove.

Figure 6.1 Ownership of Appliances and Other Household Assets

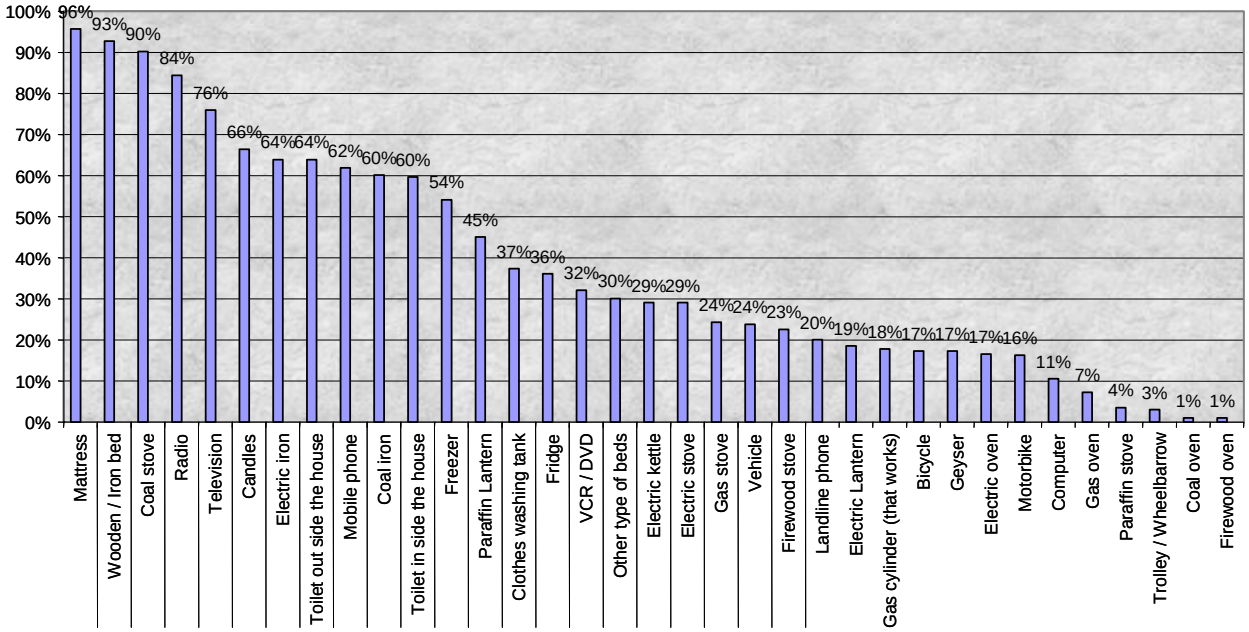
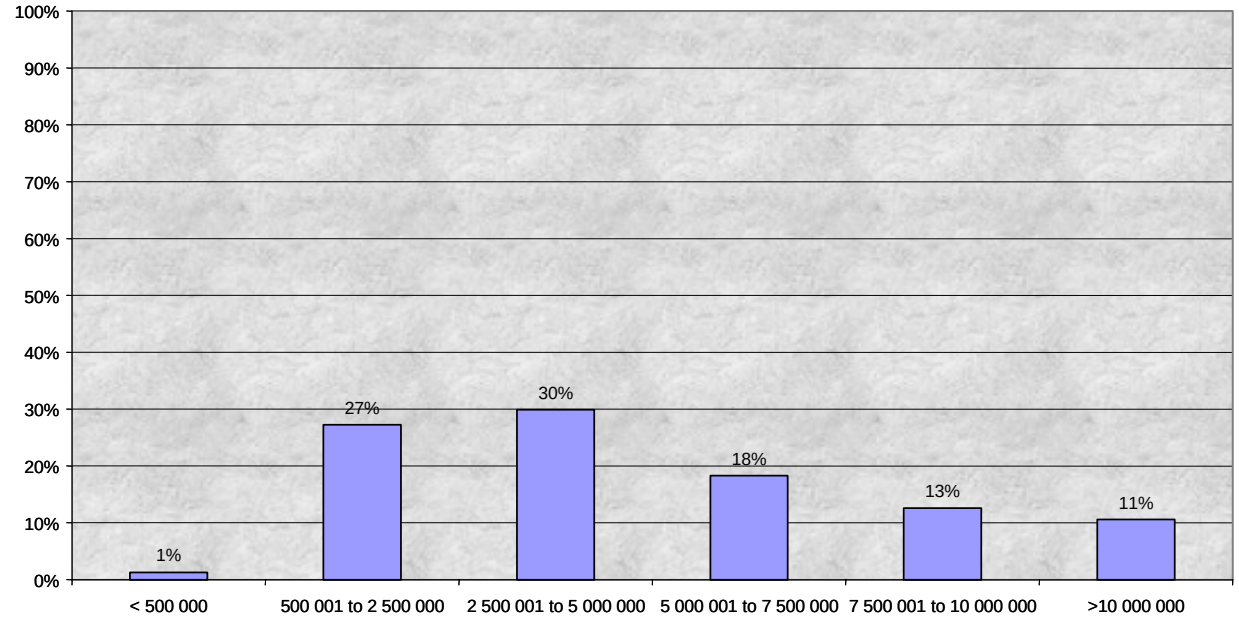


Figure 6.2 Distribution of Household Income

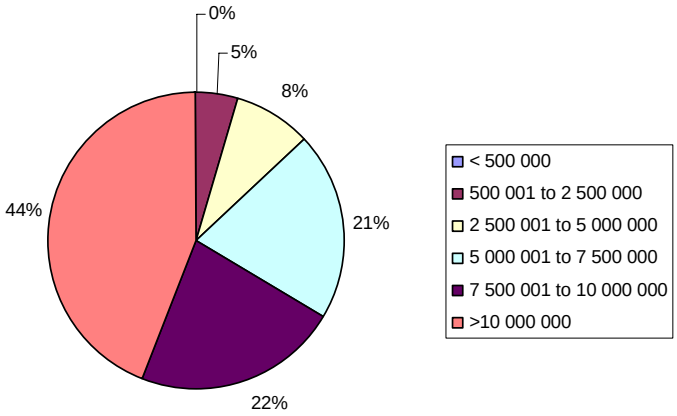


As indicated in Figure 10.2, less than 1% indicated a household income of less than 500 000 MZM (US$25) per month; 57% indicated a combined household income of between 500 000 MZM to 5,000,000 MZM per month ($25 to $250). About 11% indicated a combined household income of over 10,000,000 MZM ($500). As stated earlier, this survey was deliberately skewed towards these relatively higher-income households, since they are the primary target for

switching to LPG. The average household GNP for the entire Province is very low (about $8 per month).

Cross-tabulating income distribution with household ownership of LPG stoves indicates that, as expected, gas stoves are primarily owned by higher income families (87% of households who own a gas stove have household incomes of over $250 per month). Figure 6.2a below shows the gas stove ownership by distribution of household income.

Figure 6.2a Gas Stove Ownership by Household Income Distribution



6.4.2 Fuel Use Characteristics

As shown in Figure 6.3, charcoal is by far the most widespread and commonly used fuel and is followed by electricity from EDM (Electricidade de Moçambique). Candles are used for illumination. About 22% of respondents use LPG as a fuel. It should be noted that while 22% indicated that they also use LPG, they might not exclusively use only LPG for cooking.

In fact, most people use multiple fuels to meet their cooking needs. The decision to use a particular type of fuel is dictated by a variety of factors including food being cooked and cost of fuel. The survey offers some interesting insights: for example, 75% of the sampled household claim to use electricity and charcoal (alongside other fuels which might also be used), while some 21% claimed to use electricity and gas (again, alongside other fuels). It is also of interest to note that of all respondents who claim to use gas in their homes, 88% also use charcoal, and 99% use some form of electricity (line supply or battery). There is however an opportunity for increased penetration of LPG among a section of households.

Figure 6.3 Usage of Different Fuels

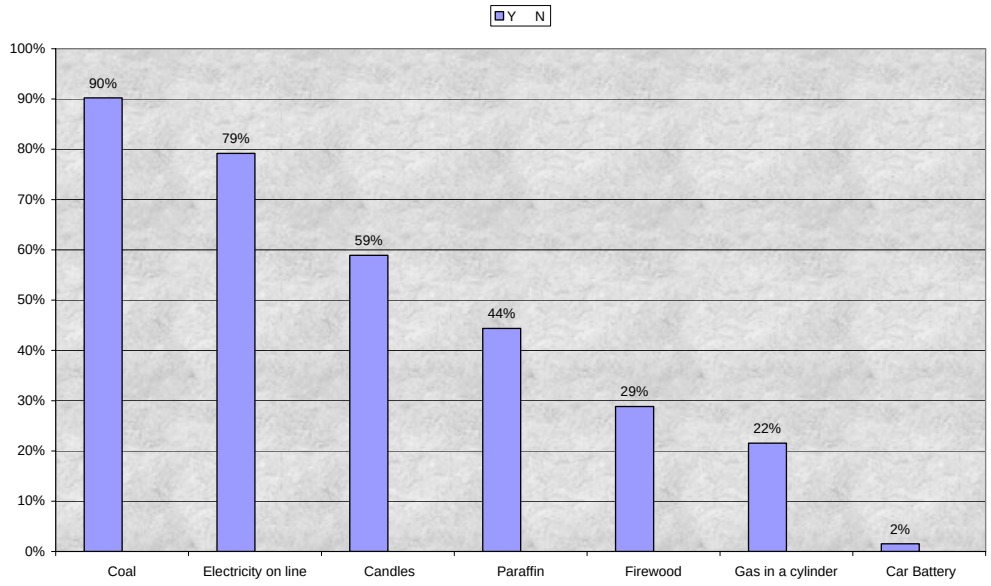


Figure 6.4 shows the average monthly household expenditure on food and fuels. The average monthly expenditure on fuels varies considerably depending on the fuel used by the household. The expenditure on LPG is based on responses of households that actually use LPG. Based on the survey results, the average monthly expenditure on fuels is as follows: Electricity (battery) - $45.4; Electricity (line) - $43.4; LPG - $15.6; Charcoal - $6.9; Firewood - $2.5; and Paraffin - $2.3. While expenditure on electricity is higher than on other fuels, electricity is also used for a variety of end uses other than cooking. Average expenditure on charcoal is about half that on LPG.

Figure 6.4 Average Monthly Expenditure on Fuels

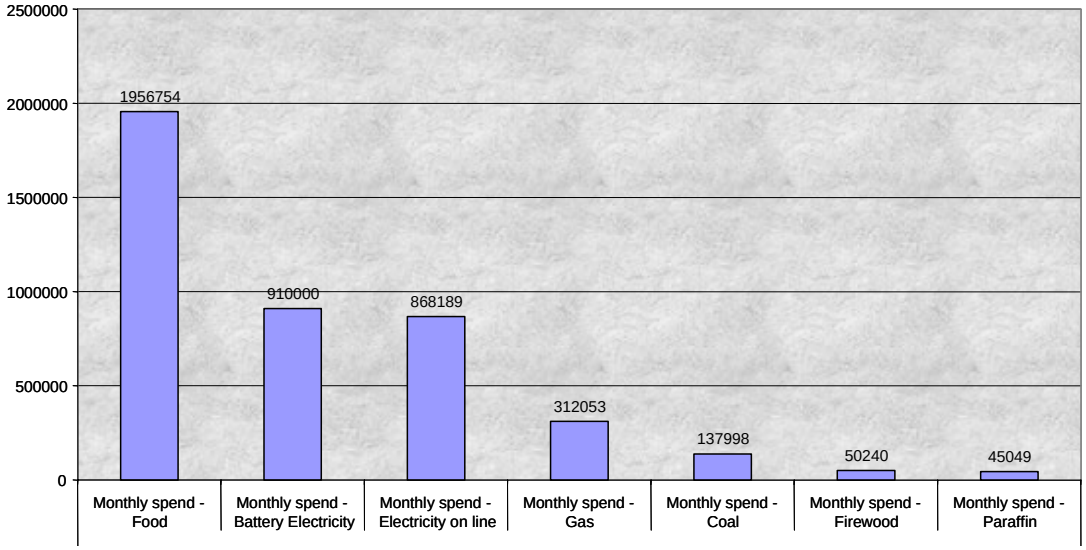


Figure 6.5 shows the frequency of LPG in home that actually use LPG for cooking. In the 22% households that use LPG, 64% claim to use it daily. But it should be noted that this again does

not mean that the household uses only LPG for cooking. It might still be using other fuels such as charcoal, and using LPG for specific cooking applications.

Figure 6.5 Frequency of LPG Use Among Households that Use LPG

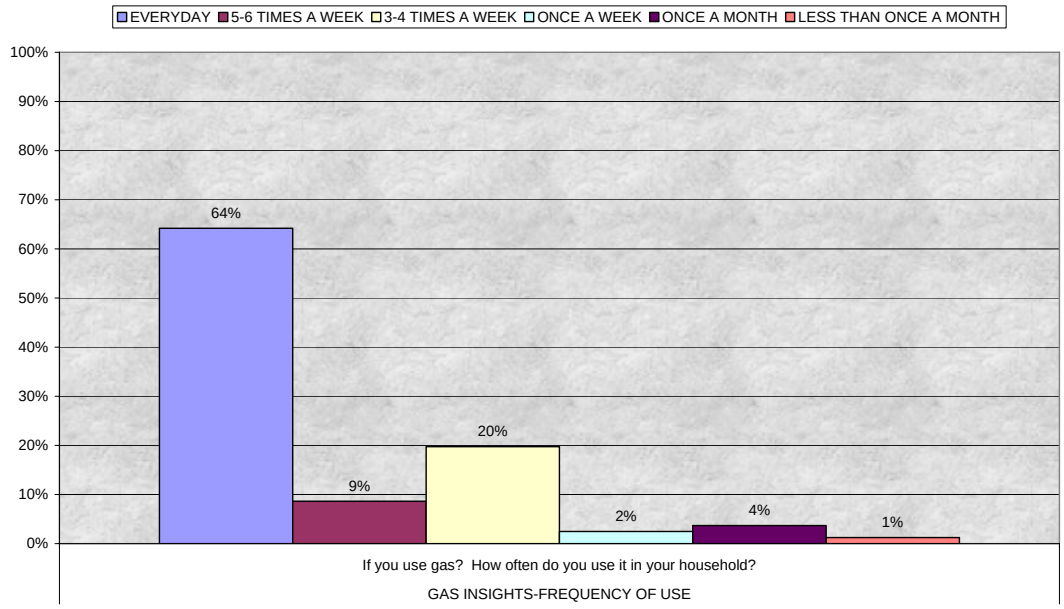


Figure 6.6 Average Monthly Expenditure on LPG

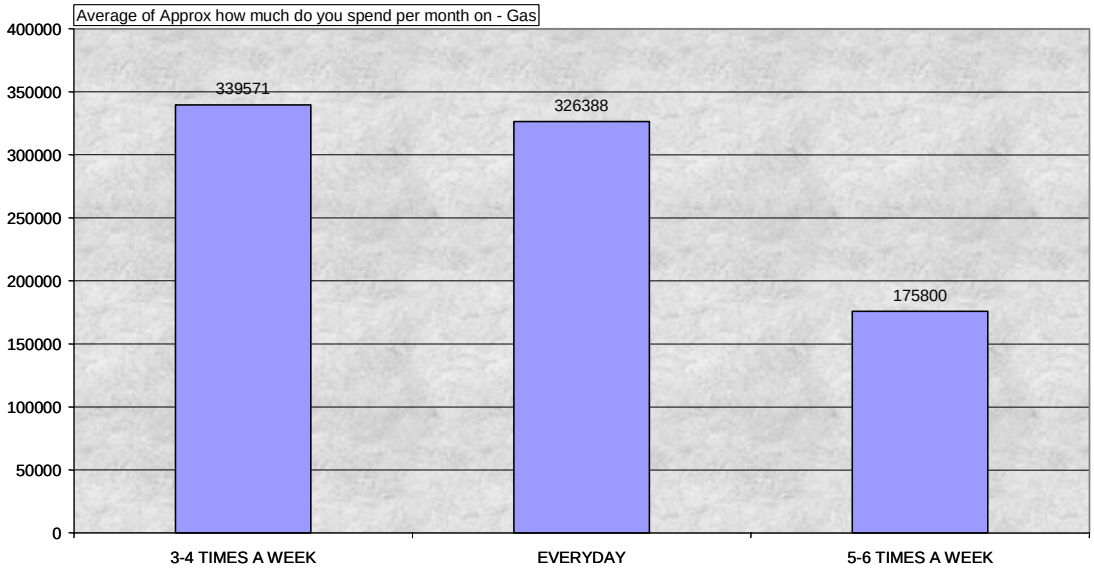


Figure 6.6 shows the average monthly expenditure on gas in households that use LPG. The figures are based on the frequency of use. It should however be noted that these figures do not account for the volume of gas used. The average monthly expenditure on gas (in households that use gas) is estimated to be about US$15, which is high relative to the average income.

6.4.3 Awareness and Knowledge of LPG

While about 88% of survey respondents had heard of LPG, close to 50% lacked a comprehensive understanding or knowledge about the product. But the remaining 50% indicated good knowledge of LPG though they were not necessarily using the product (see Figures 6.7 and 6.8).

This points to the need for an intensive awareness campaign to make people aware of the uses and benefits of LPG.

Figure 6.7 Awareness of LPG as a Fuel

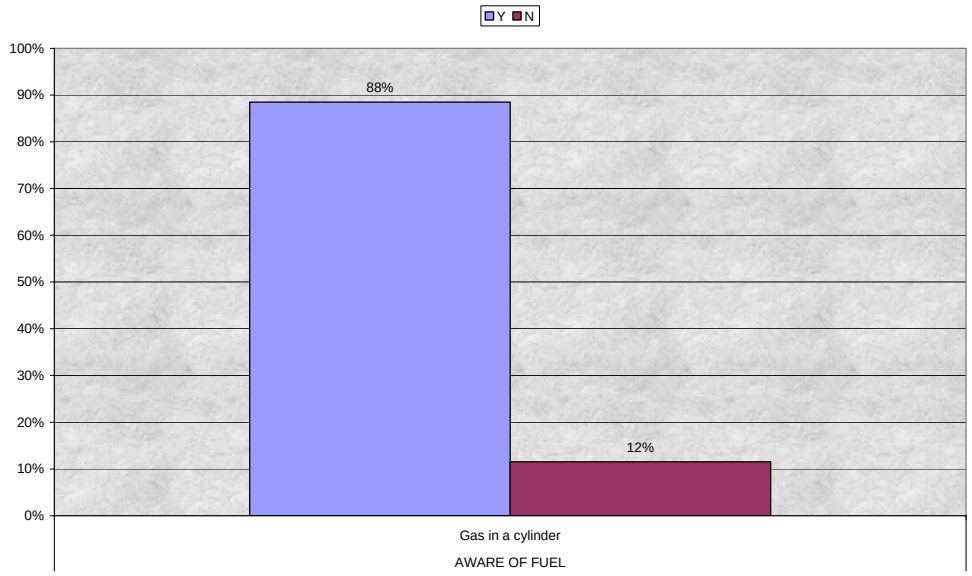
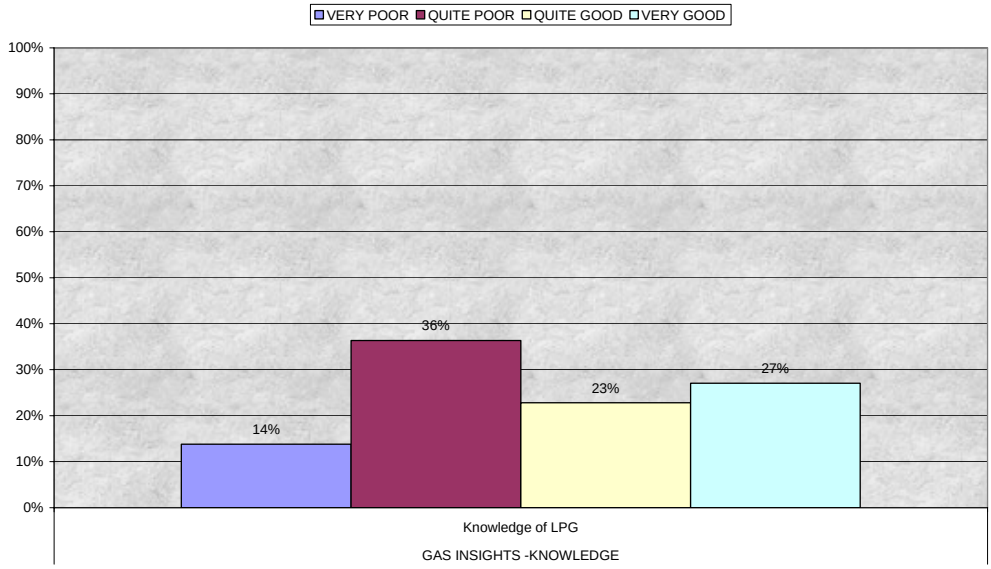
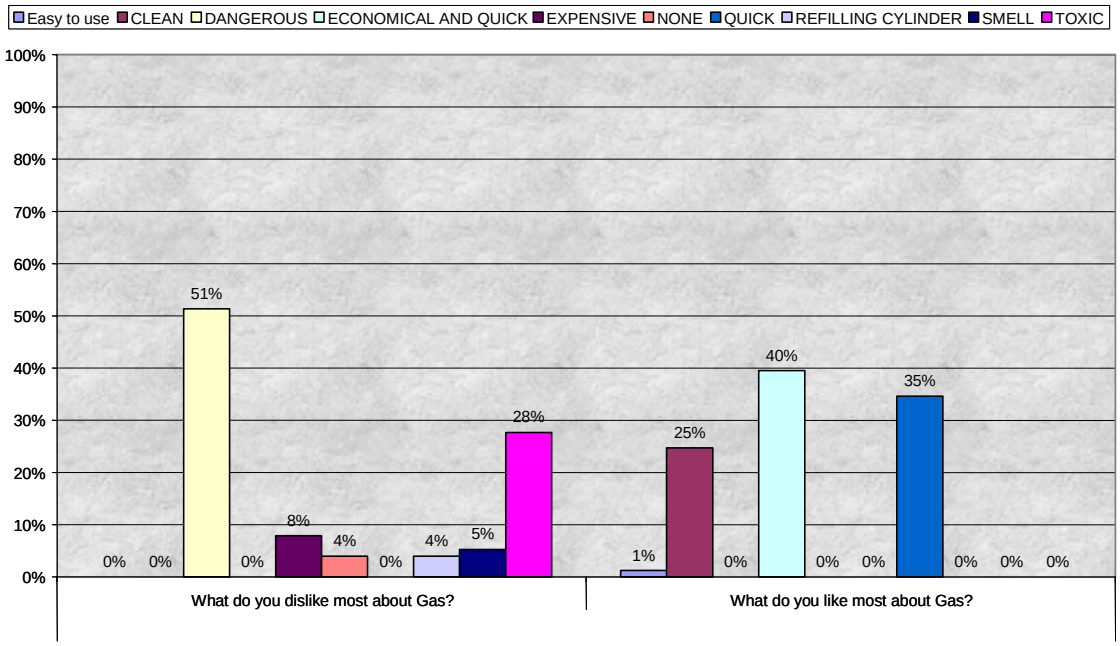


Figure 6.8 Knowledge of LPG



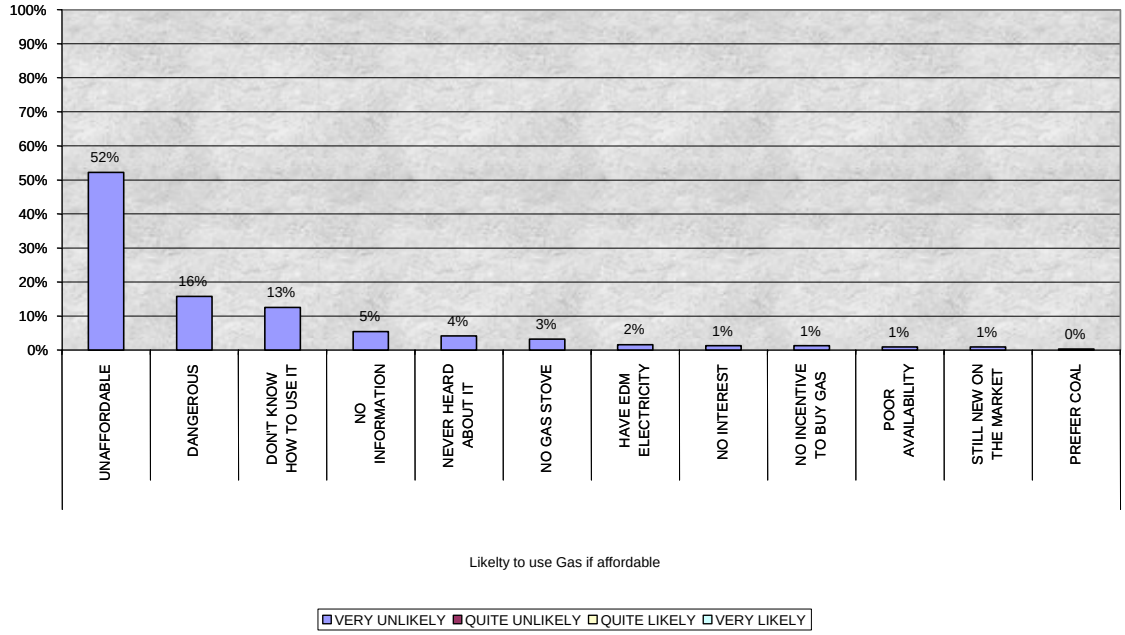
When respondents were asked about their perceptions of LPG as a fuel, only about 20% chose to respond! As can be seen from Figure 6.9, of those responding, at least half expressed some fear that LPG was a dangerous and unsafe product because of its "explosive" nature. A further 28% indicated that it was toxic. On the positive side, 29% of those responding expressed the view that LPG is "a clean and economic source of energy". Also, significant is the fact that "Ease of use" was also mentioned by several respondents.

Figure 6.9 Perceptions of LPG as a Fuel



In contrast to only 20% responding to the question on their perception of LPG as a fuel, almost 80% responded when asked why LPG was not used in the household. The most common responses (see Figure 6.10) were about the "Affordability" (at 52% of the responses), "Danger" (at 16% of the responses) and "Ignorance" about LPG and its uses (at 13% of the responses).

Figure 6.10 Perceptions of Why LPG is not Used in Households



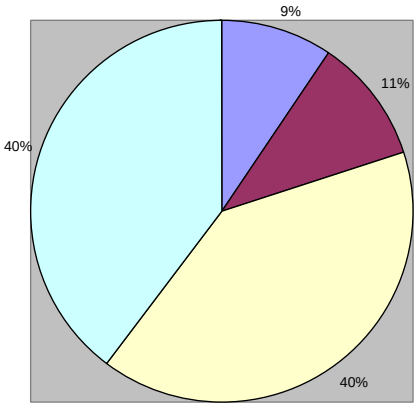


Figure 6.11 Likelihood of Using LPG

Interestingly, when asked whether or not the respondents would consider using LPG if they had the opportunity and all things being equal, about 80% of the respondents said they were likely or very likely to do so! (See Figure 6.11)

Of the respondents using LPG in their households, cooking was the primary end use. A small percentage of households reported using LPG for lighting and refrigeration. See Figure 6.12.

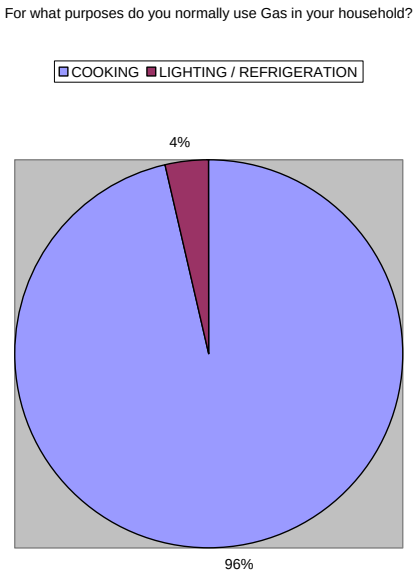
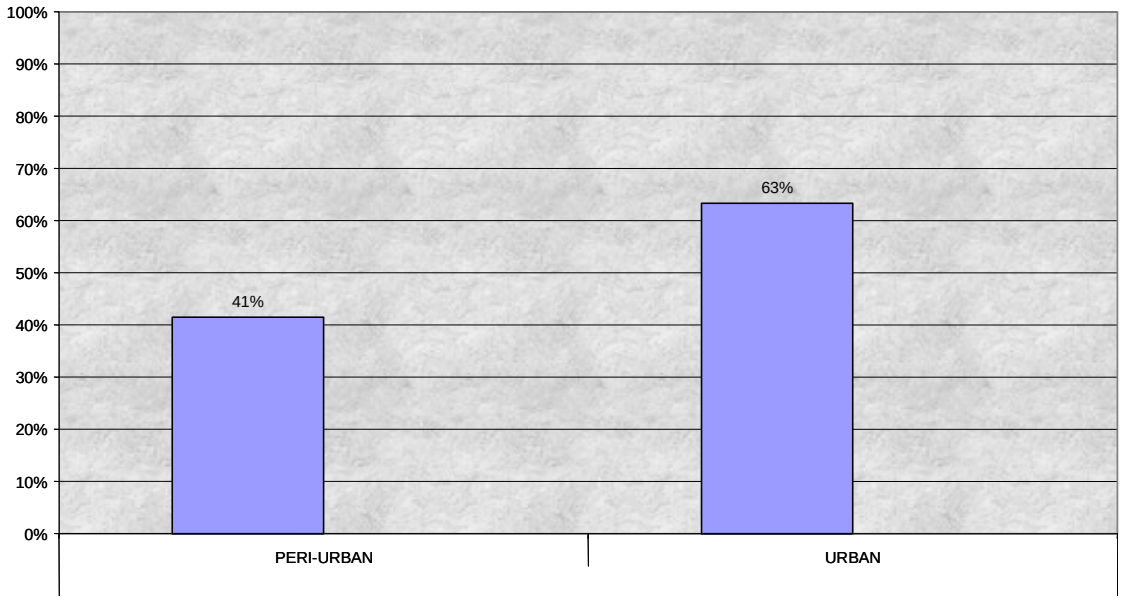


Figure 6.12 End-uses Operated with LPG

6.4.4 Availability and Distribution of LPG

When respondents were asked to comment on the ease of availability of gas, the overall response was evenly divided between those who felt it was conveniently available and those who did not feel so. It should however be noted that the response from Urban and Peri-Urban areas was not the same. In Urban areas, 63% of the respondents indicated that LPG is conveniently available, while in Peri-Urban areas 41% responded that LPG was easily available (see Figure 6.13). It should be noted that these again are perceptions based on their knowledge of LPG sales outlets since many of the respondents do not actually use LPG.

Figure 6.13 Availability of Gas in Urban and Per-Urban Areas



Customer response to their perception or knowledge of where LPG is sold and cylinders filled also indicates that respondents in Urban areas are better informed then those in Peri-Urban areas. The responses suggest that most people perceive that LPG distribution is limited to very specialized outlets such as Vidagas and Ceconur shopping outlets, and most are not aware that LPG is also sold in informal markets, supermarkets and other convenience stores. See Figures 6.14 and 6.15.

Figure 6.14 Customer Perception of Where LPG is Sold

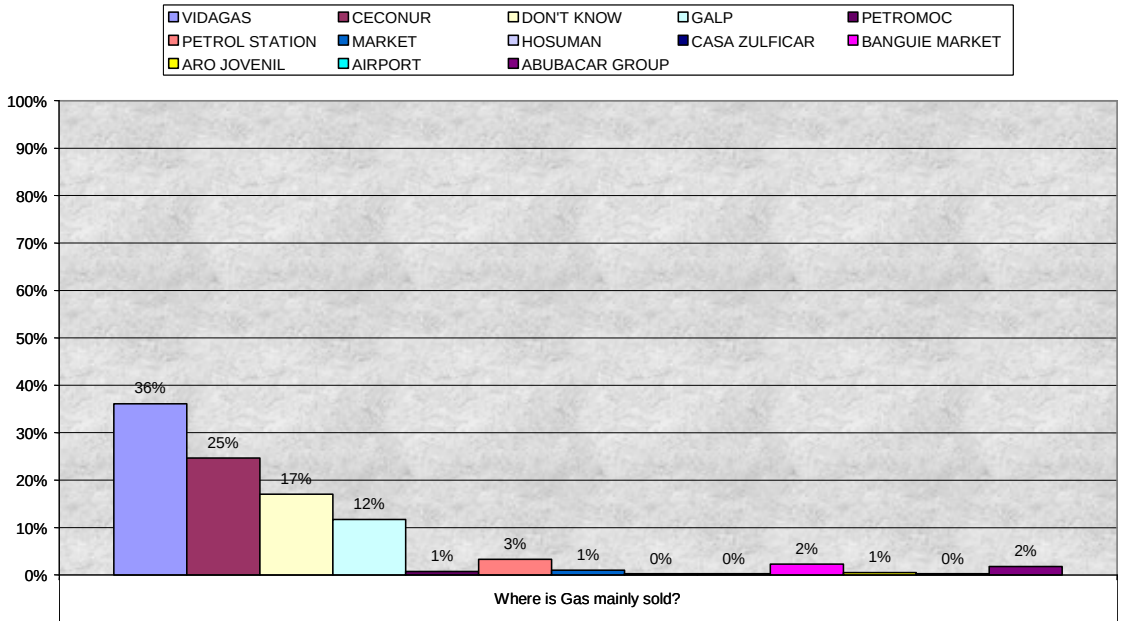
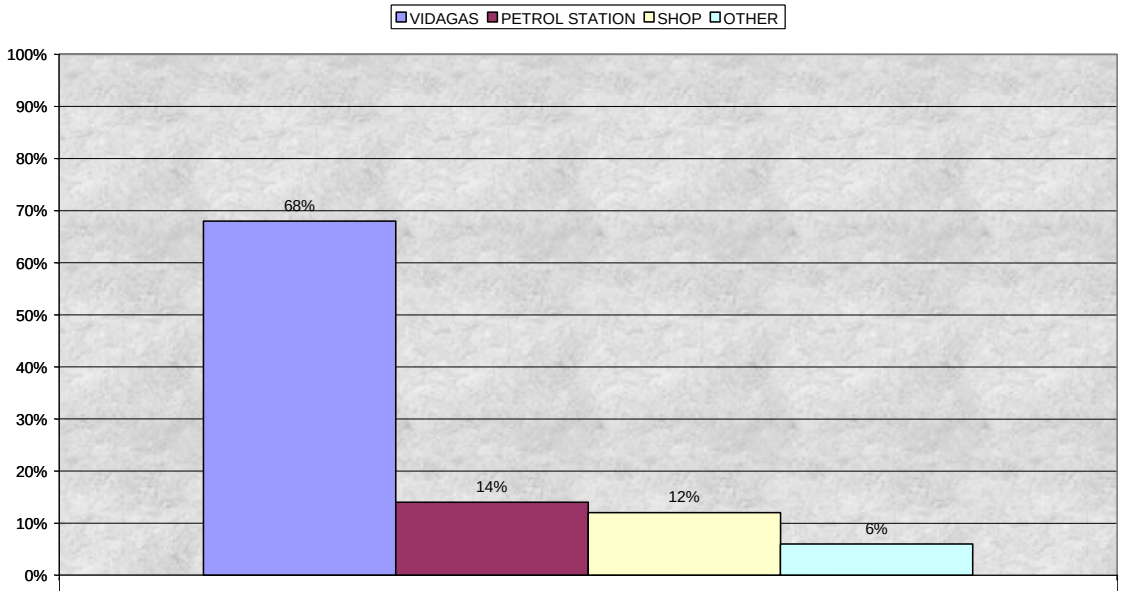


Figure 6.15 Customer Perception of Where LPG Cylinders are Filled

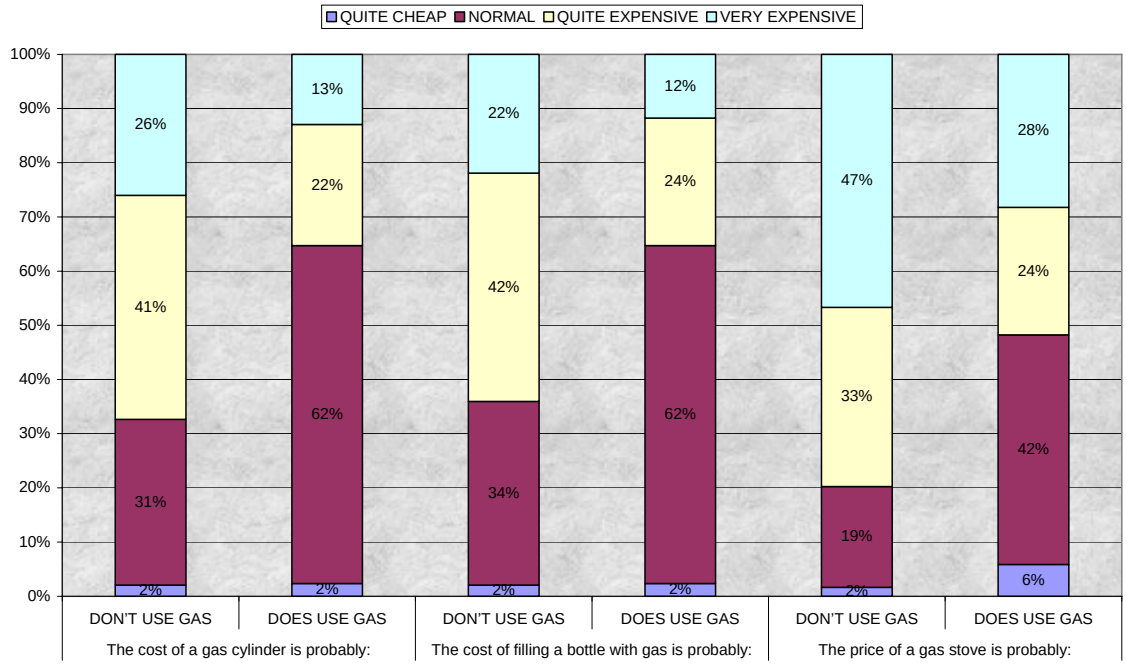


6.4.5 Perception of Price of LPG

Overall, none of the respondents feels that LPG is cheap. However, respondents who do not use gas are much more likely to indicate that gas is expensive compared to those who use gas. This is especially true with respect to the cost of refilling gas cylinders (see Figure 6.16). As see from the Figure, about 64% of respondents who use gas do not believe that the cost of a cylinder is high, but two-thirds of non-LPG users feel that the price is high. Similarly, while just half the LPG users feel that the costs of a gas stove is high, 80% of the non-users feel that the cost of a gas stove is high.

While these perceptions may be influenced by and are related to the respondents' overall income, it points to the importance of making potential consumers aware of the product and its price. Good communication and awareness campaigns can make a huge difference and help create and increase market penetration among non-LPG users.

Figure 6.16 Perceived Cost of Using LPG among Users and Non-Users



Survey respondents were also questioned on the typical mode of transport used to make routine day-to-day purchases and other less frequent larger purchases. The responses (see Figures 6.17 and 6.18) indicate that when going shopping, peri-urban respondents are more likely to walk or use public transport than are their urban counter-parts.

Given the present location of LPG sales outlets and their distance to the peri-urban areas where most of the respondents live, it is very probable that LPG sales will continue to lag behind those of competing fuels that are sold within the informal markets, convenience stores, and even households situated in the heart of the peri-urban areas.

Figure 6.17 Mode of Transport Used to go Shopping

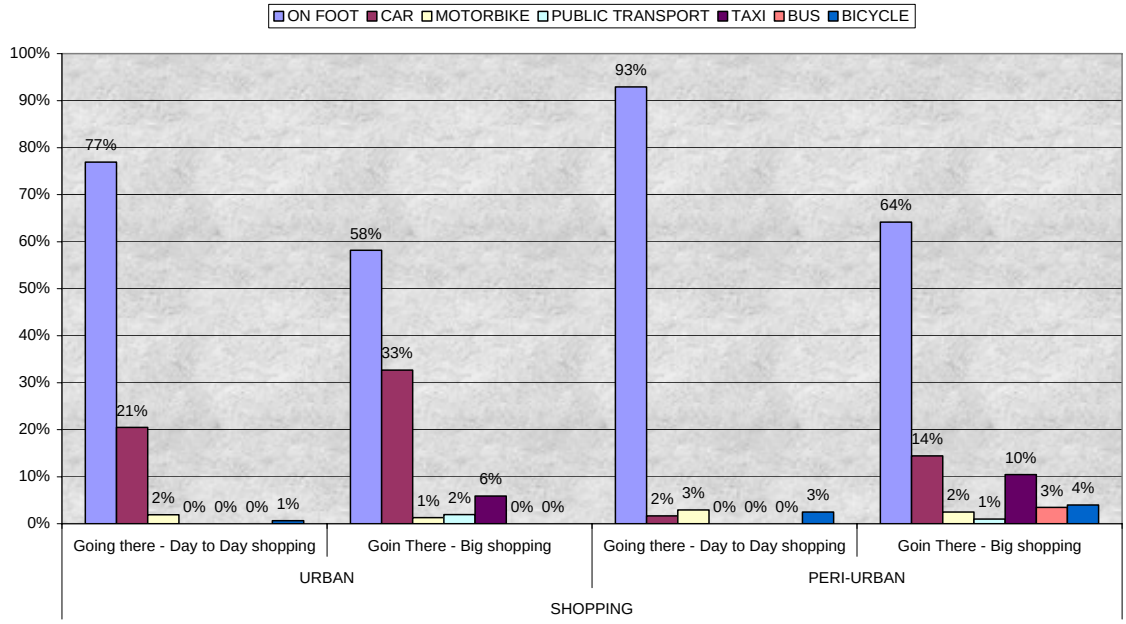
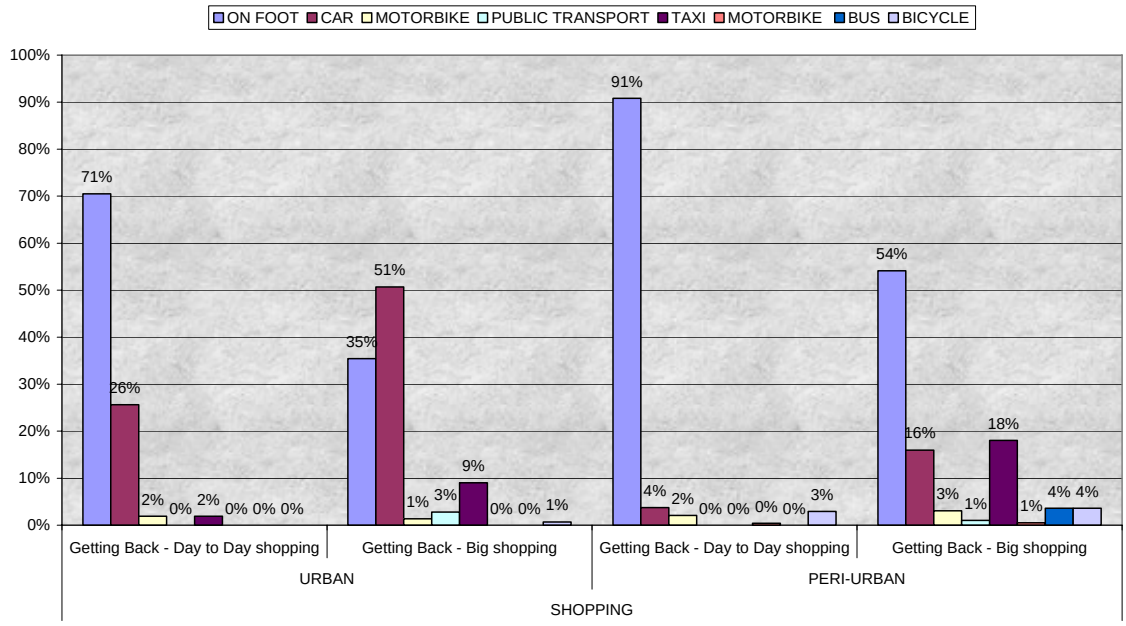


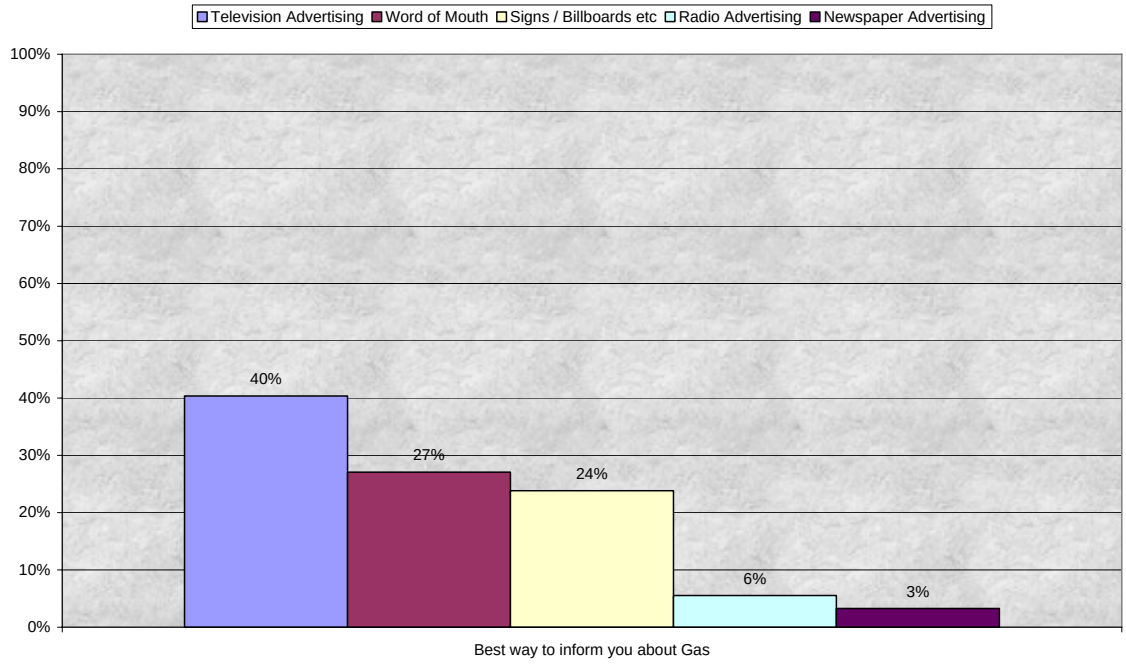
Figure 6.18 Mode of Transport Used to Return from Shopping



6.4.6 How to Create Awareness

According to the respondents the best way to disseminate information about a new product such as LPG would be via television. Word-of-mouth messages was also suggested as an effective means to market a product (see Figure 6.19). It is important to note however that the means of creating awareness would have to be tailored to the targeted customer segment. While television campaigns may be more effective in urban areas, word-of-mouth campaigns and use of local community leaders may be more effective in per-urban areas.

Figure 6.19 Customer Perception of Creating Awareness of LPG



6.4.7 Important Fuel Attributes

Respondents were queried on attributes they felt were important in typical household fuels and on attributes important for LPG. The importance accorded to various attributes were also ranked as follows:

Rating of Fuel Attributes

1 to 2 = Low to somewhat low importance

2 to 3 = Somewhat low to somewhat high importance

3 to 4 = Somewhat high to high importance

Attributes with ratings of 3 and above thus indicate important considerations for customers.

Rating of LPG Attributes

1 to 2 = Poor to quite poor

2 to 3 = Quite poor to quite good

3 to 4 = Quite good to good

Thus ratings below 3 indicate a somewhat negative perception of the value of LPG as a fuel.

Figure 6.20 below shows the ratings given to various attributes that customers felt were important in a household fuel. Figure 6.21 compares fuel ratings to ratings given to LPG as a fuel.

As seen in the figures, the attributes important in a fuel are Good for cooking, Fair Price, Ease of Use, and Safety. LPG rates highly for it been a good cooking fuel and for its clean burning abilities, but is ranked poorly for other attributes.

These rating are an indication of customer perception. The negative perception of LPG as a fuel indicates that there is a need for increased consumer education and awareness to promote wider LPG usage.

Figure 6.20 Rating of Attributes Important in Household Fuels

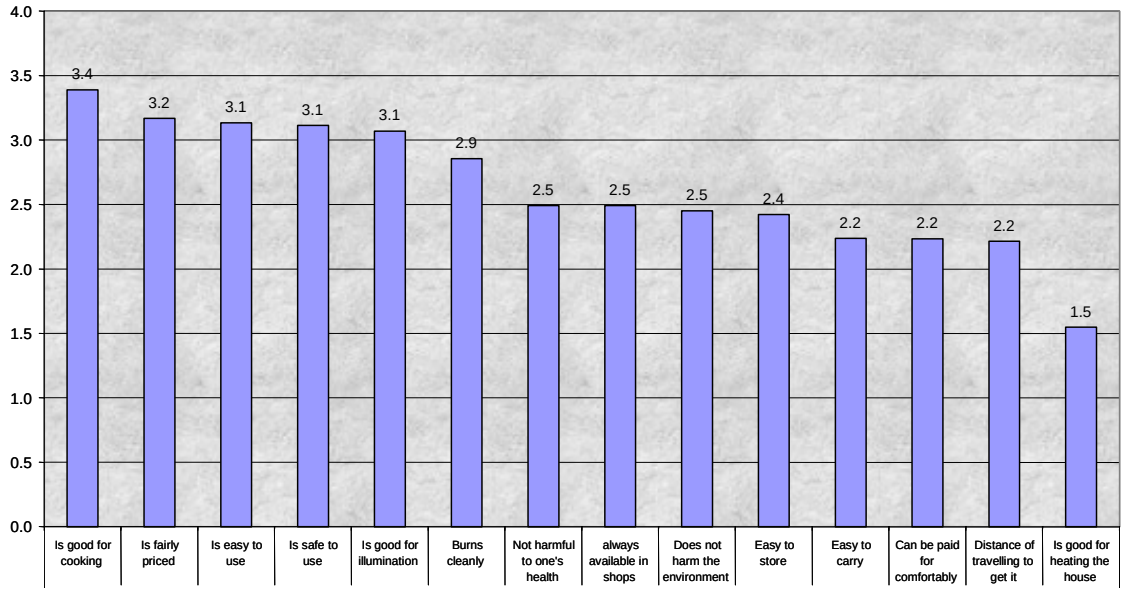
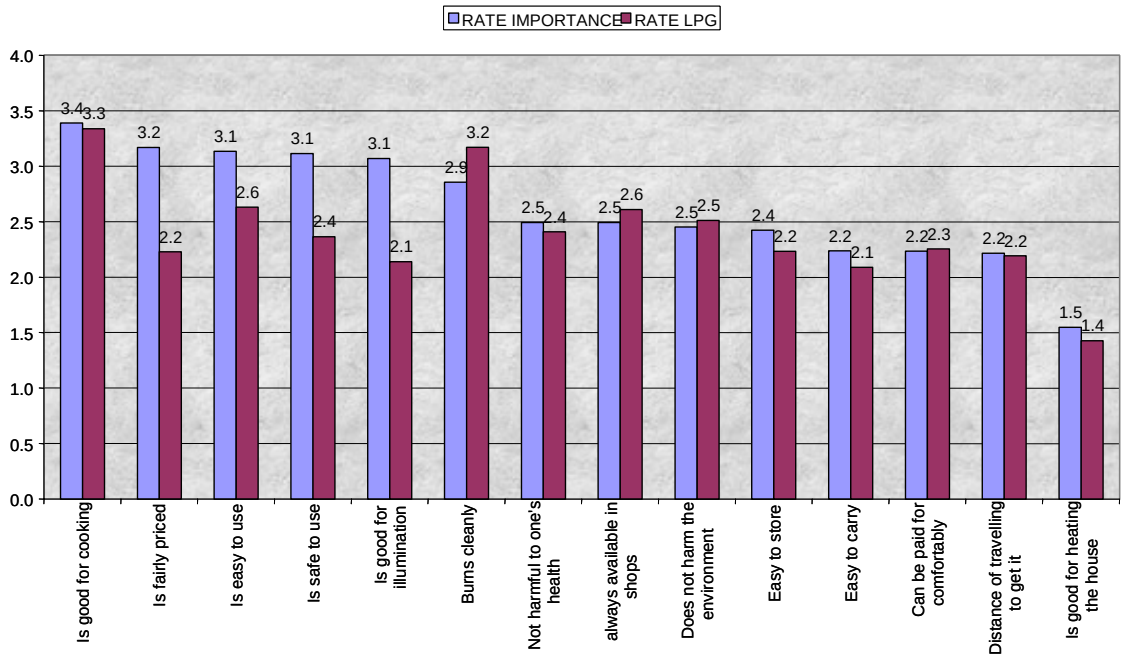


Figure 6.21 Rating of Attributes of LPG as a Fuel



6.5 TRADER MARKET SURVEYS

An additional 100 interviews were conducted among randomly selected fuel traders and food vendors. The purpose of this survey was to gain insights into the influencing factors in the traders' decisions to buy and sell fuel. The results of this survey will help identify opportunities and strategies for increasing sales through LPG traders and use of LPG among food vendors within the local communities.

The fuel trader and food vendor surveys comprised 100 interviews with randomly selected traders using intercept interview methods. Only traders who indicated that they sold fuel or operated a business that sold cooked food were included in the sample. The sample was split as follows:

- 29% of the sample comprised were firewood traders
- 32% of the sample comprised charcoal traders
- 13% of the sample comprised traders who sold cooked food
- 26% of the sample comprised traders who sold other fuels such as paraffin, candles and kerosene

There are no accurate census figures to indicate the exact purchasing power and distribution of commercial outlets in the city. The rationale for selecting the above sample splits was thus based on the surveyor's previous market research experiences and knowledge of the market. They surveys were thus weighted in favor of the type of respondents that were more likely to be informed and concerned about the fuel products under consideration.

The areas covered by the survey included the following neighborhoods:

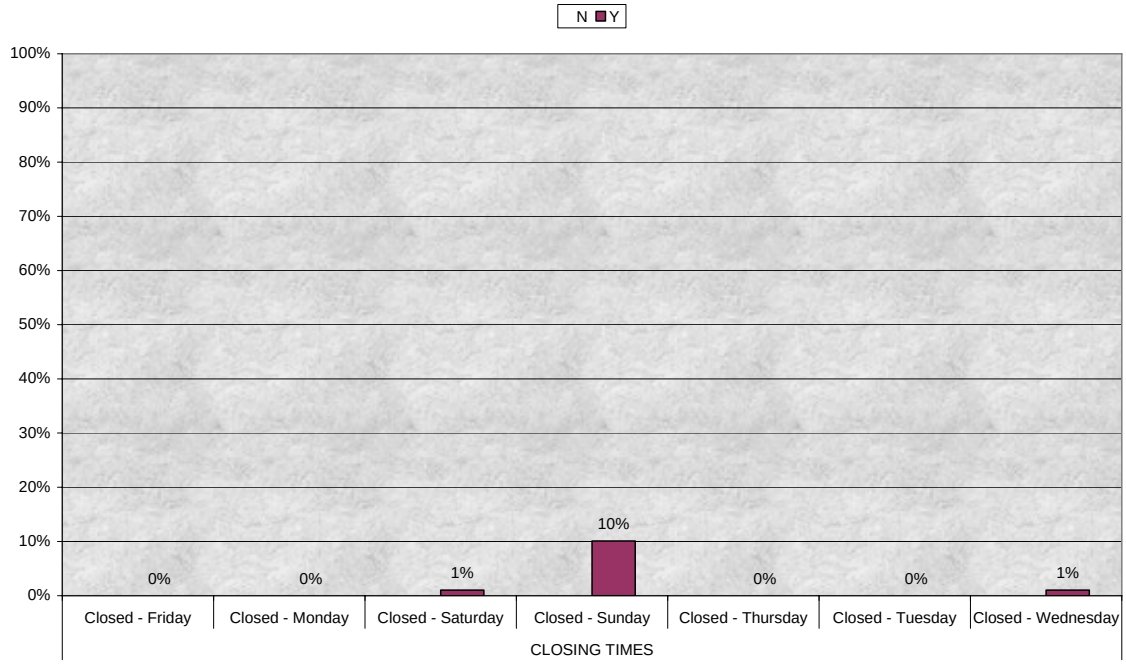
- Bairro Cimento in the urban/cement part of town, and
- Bairrros de Ingonane, Paqutequete, Natitte, Cariacó, Alto Gingone, Nanhimbe and Chuiba (all located in the peri-urban/outskirt neighbourhoods

6.6 FUEL TRADER MARKET SURVEY RESULTS

6.6.1 Trader Characteristics and Profile

Most of the traders who participated in the study operated their businesses within the informal market sector in Pemba and did not close their stores during the week. In fact, only 10% of the selected traders indicated that they closed their stores on Sundays (see Figure 6.22).

Figure 6.22 Store Closing Days



A little over a third of all the traders interviewed in this study (about 37%) indicated that they had some form of storage space on their premises.

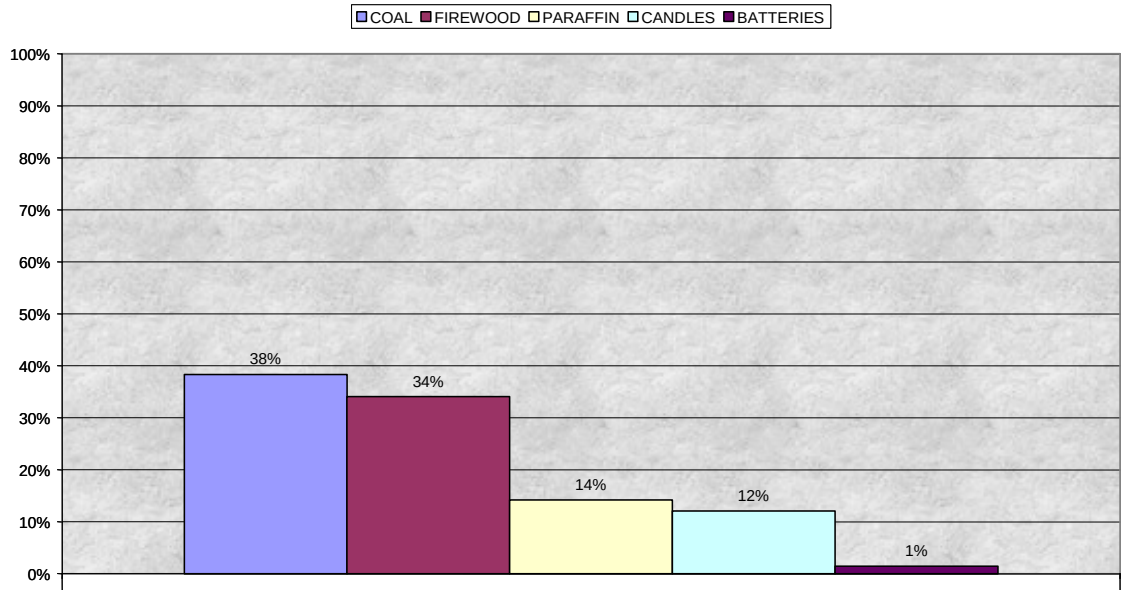
Among the fuel traders surveyed, the breakdown of fuel sold is as shown in Table 6.4.

Table 6.4 Fuels Sold by Traders

Trader	% Traders Selling Fuel
Charcoal	32%
Firewood	29%
Paraffin	14%
Candles	12%
LPG	1%

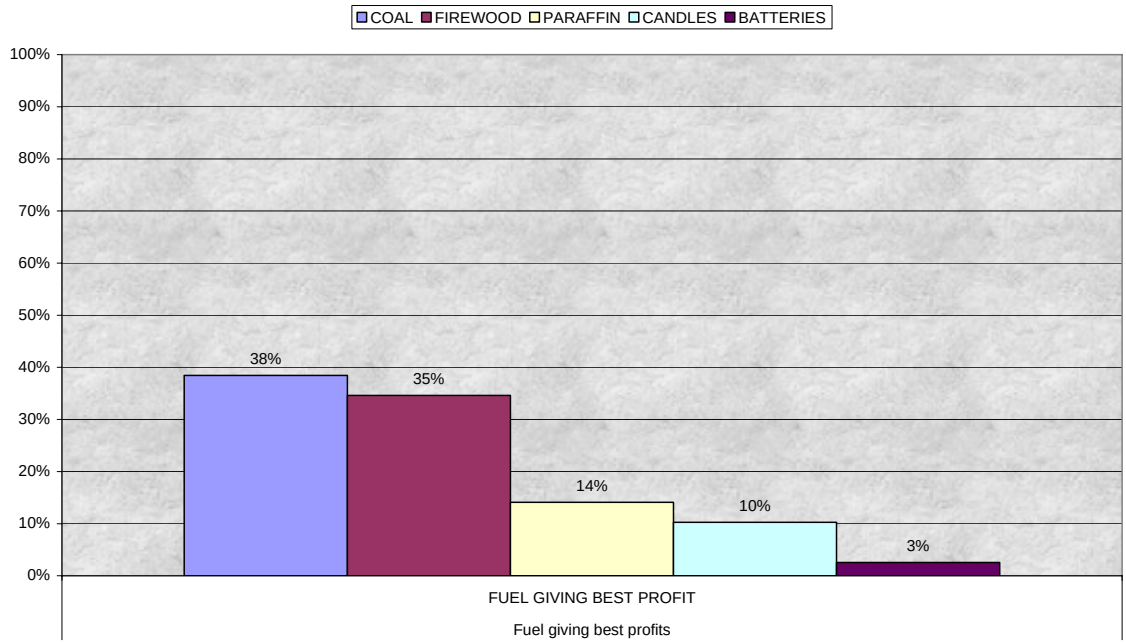
Figure 6.23 shows the breakdown of various fuels sold by the traders. Charcoal, predictably, was the most sold fuel and LPG was the least sold fuel given its low market penetration.

Figure 6.23 Fuels Most Sold by Traders



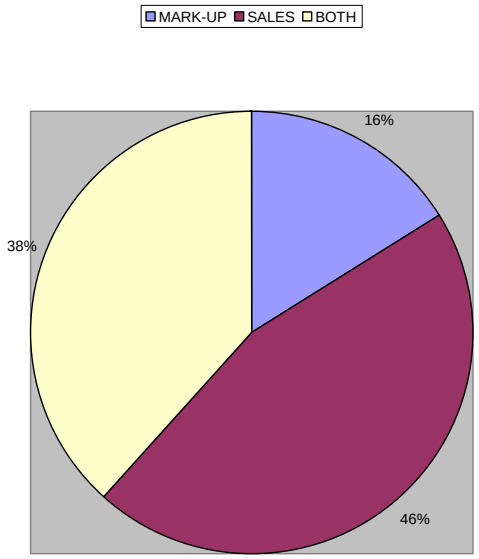
Traders were asked to indicate the fuel types that had the best profit margins (see Figure 6.24). Charcoal and firewood again received the highest ratings at 35-38%. However, these responses must be considered in light of each trader's business experience, especially given that most traders only stock two or three types of fuel products and are unaware of the potential margins generated by the alternative fuels that they do not stock.

Figure 6.24 Fuels that Generate the Most Profit



Many of the fuel traders are typically small retailers who are primarily in business to make a basic living, and they generally take a simplistic view of profitability. In the survey, 46% of traders attributed the margins they made from the sale of fuel to the sales turnover (which is an indicators of the product's popularity), and some 38% used a combination of turnover and product mark-up to gauge profitability. Only 16% of the traders attributed their high product margins to mark-ups alone (see Figure 6.25). But it is clear that volume of sales is critical for the trader to make profits in the fuels business.

Figure 6.25 Reason for Profitability



6.6.2 Fuel Suppliers to the Traders

According to the survey findings, the traders obtained their fuel from a number of sources as shown in Table 6.5.

Table 6.5 Fuel Suppliers to the Trade

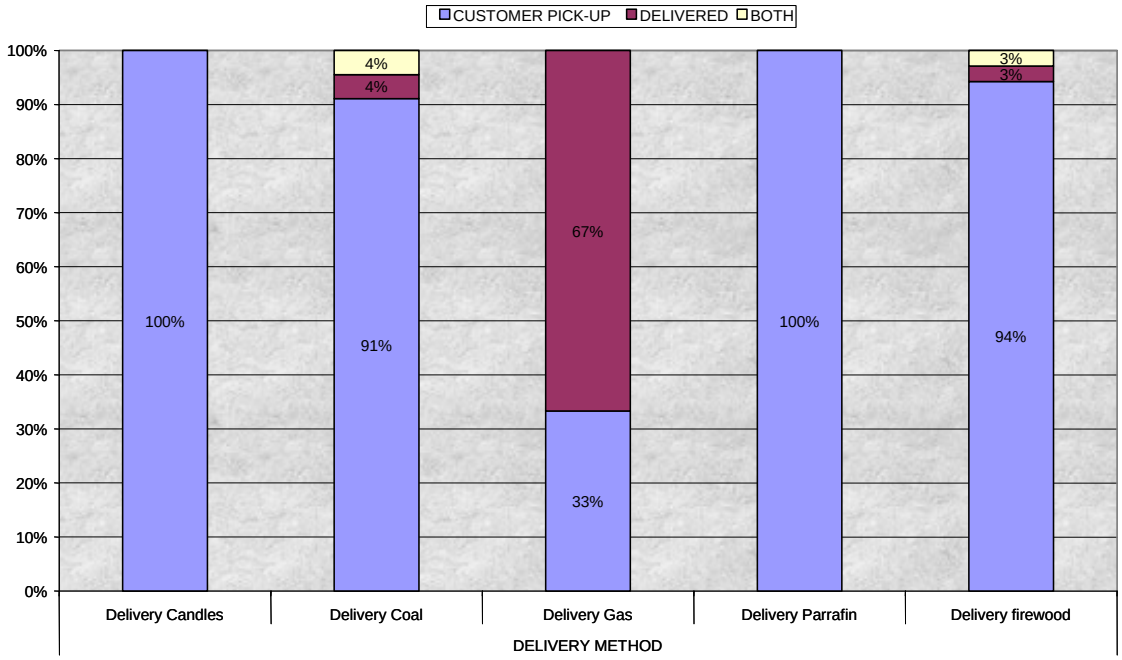
SUPPLIER	Gas	Candles	Paraffin	Coal	Firewood
GANHA POUCO (TRADER)		8%			
GINGANO (PLACE)					3%
JORGE (TRADER)				2%	
M. CARIACO (PLACE)				2%	
MERCADO (LOCAL MARKET)					3%
MERCADO INGONANE (LOCAL MARKET)				2%	
MERCADO PAQUITE (LOCAL MARKET)				2%	
MH ARMAZENS (TRADER)		8%			
MORREBUE (PLACE)					3%
NANKARAHO (PLACES)				2%	
NANKARAMO (PLACE)					3%
NANLIA (PLACES)				2%	
NBIRE (PLACE)					3%
NIPATAGO (PLACES)				2%	
POPULACAO (LOCAL MARKET)					3%
PRAIA RUELA (PLACE)					3%
RUELA (PLACE)					3%
SALIMO COMERCIAL (TRADER)		8%			
SOERA (TRADERS)					3%
SR EUGENIO (TRADERS)					3%
SR FRANCESCO (TRADER)				2%	
SUPPLIER	Gas	Candles	Paraffin	Coal	Firewood
CAMPONESES (PEASANT FARMERS)				36%	55%
BOMBAS (FUEL STATION)			38%		
LOCAL TRADERS				11%	
PETROMOC (FUEL STATION)			38%		
GALP (FUEL STATION)	33%		23%		
CARIACO (PLACE)				5%	3%
COMERCIANIES (TRADER)				7%	
ARMAZEN (TRADER)		15%			
ARMAZENISTA SELEMANE (TRADER)		15%			
COMERCIANTE (TRADER)		15%			
INFORMAL MARKET				5%	
NEIGHBOURHOOD				5%	
OSMAN YACOB (TRADER)		15%			
PRIVAVTOM (PLACE)				5%	
SENHOR NURDINE (TRADER)				5%	
VIDA GAS	67%				
ANTONIO JOAO (TRADERS)					3%
BARRACAS (INFORMAL STALL)		8%			
CAMIONISTAS (TRUCK DRIVERS)				2%	
COAL PRODUCERS				2%	
COTANRES DELENHA (PLACE)					3%
DSMAN YACOB (TRADER)		8%			
FATIMA (TRADERS)					3%

Firewood (as indicated by 55% of the respondents) and charcoal (as indicated by 36% of the respondents) are the most commonly used fuel sources and often obtained by traders from different peasant farmers located in surrounding villages. On the other hand, traders who stocked LPG only identified two suppliers located in the urban parts of town namely, Gulp (supplying 33% of the traders) and Vida Gas (supplying the remaining 67% of traders).

6.6.3 Fuel Delivery and Payment Methods

With the exception of LPG, fuels are generally obtained by the traders themselves. LPG is generally delivered to the traders by the gas companies, though a third of the traders reported picking-up the fuel stock themselves (see Figure 6.25).

Figure 6.25 Fuel Delivery to Traders

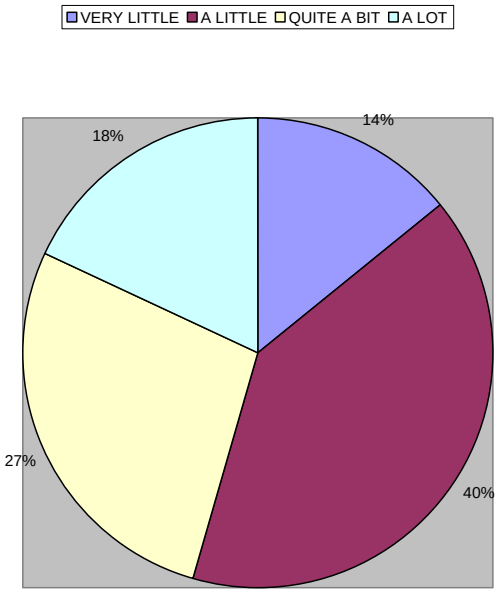


About 88% of traders indicted that they paid cash-on-delivery (COD) for their fuel purchases whilst the remaining traders made use of a combination of lay-bye (an arrangement wherein the trader makes a deposit to ensure supplies and then pays in full before obtaining the stock and selling to the customer) and credit arrangements with their suppliers.

6.6.4 Knowledge of LPG

Forty five percent of traders claimed to know a lot or quite a lot about LPG, with the remaining knowing little about the product (see Figure 6.26).

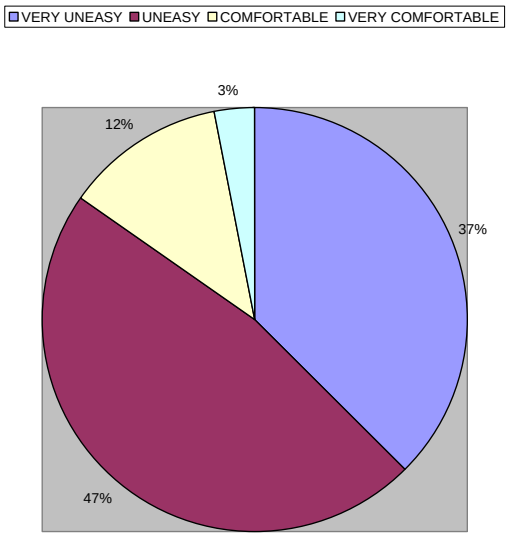
Figure 6.26 Knowledge of LPG



6.6.5 Storage of LPG on the Premises

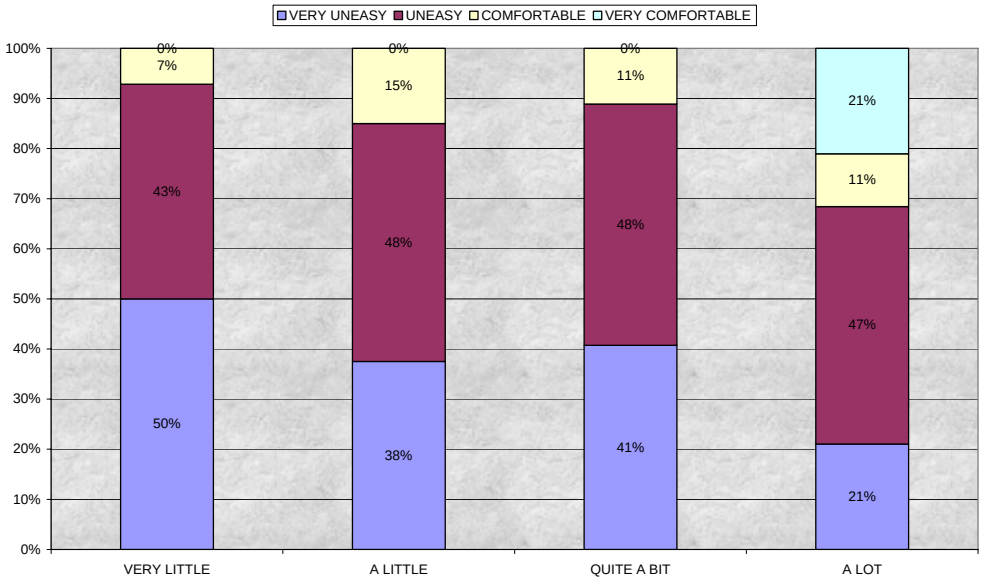
Traders' opinions about LPG storage were on the whole not very positive. Most traders were uneasy about storing LPG on their property with about 84% of respondents indicating that they were 'uneasy' or 'very uneasy' with storage (see Figure 6.27). Much of their uneasiness seemed rooted in a general lack of understanding of LPG and its nature – much of which could be dispelled through education and awareness programs.

Figure 6.27 Opinion on Storing LPG on the Premises



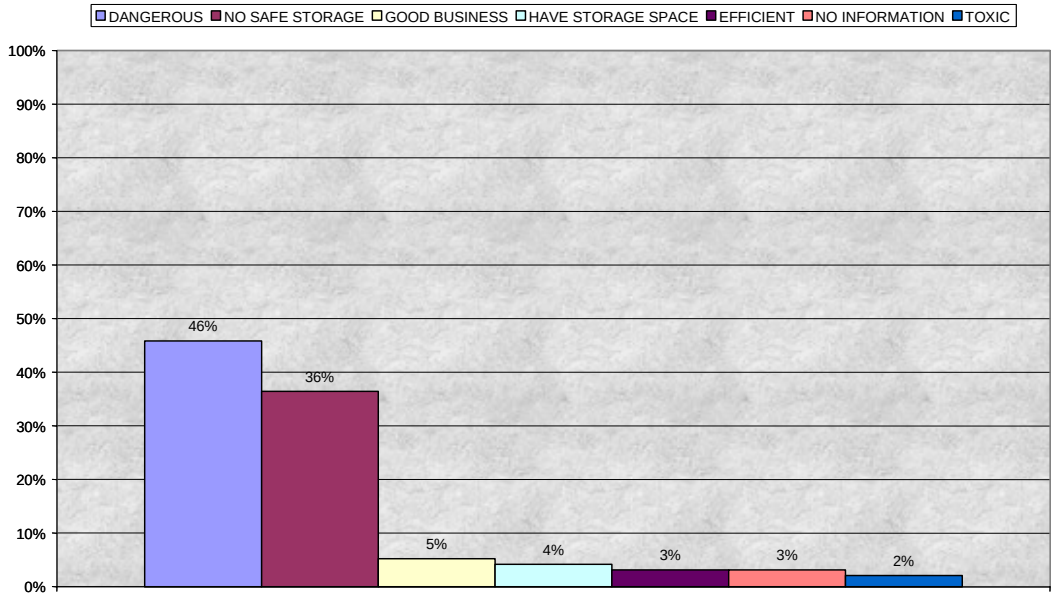
A further breakdown of trader responses is shown in Figure 6.28.

Figure 6.28 Concerns About Storing LPG Based on Knowledge of the Product



The most common reasons cited for trader uneasiness concerning LPG usage were its inherent danger and a lack of proper storage facilities (see Figure 6.29). These concerns corroborate evidence of trader ignorance and the need for consumer education programs and proper LPG storage facilities.

Figure 6.29 Reasons for Concerns about Storing LPG

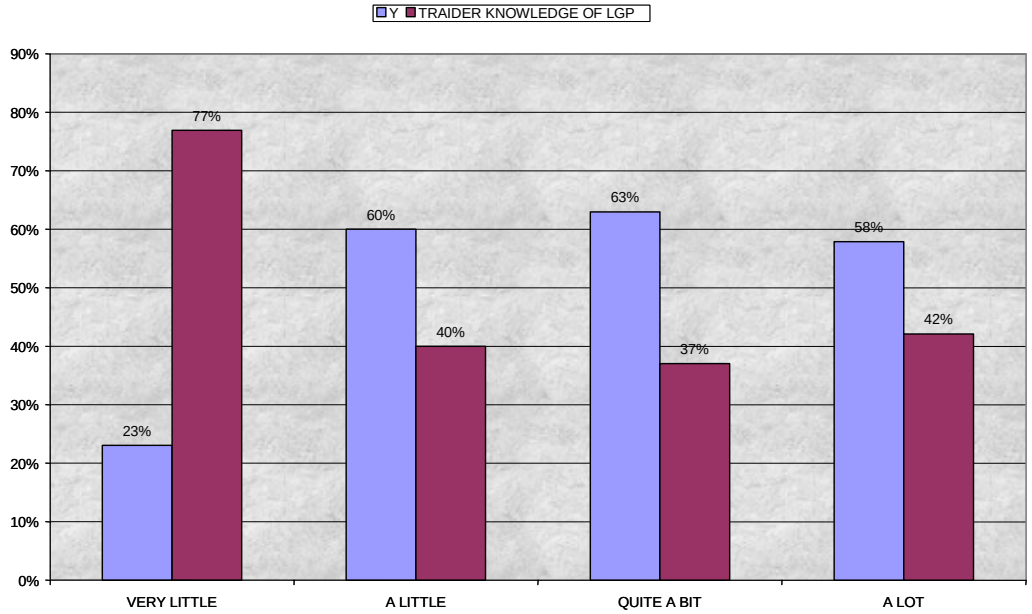


6.6.6 Willingness to Sell LPG

Despite the traders' apparent misgivings, 55% expressed their willingness to sell LPG. When the traders' responses concerning their willingness to sell LPG were cross-tabulated with their current levels of product knowledge, a strong correlation between product knowledge and

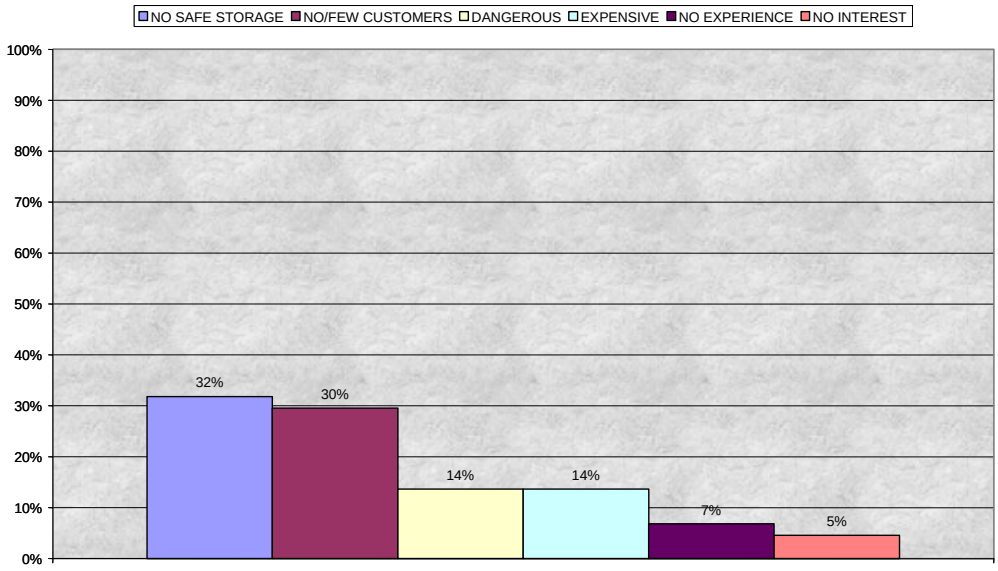
willingness to deal in LPG was evident (see Figure 6.30). This reinforces the need for trader education.

Figure 6.30 Willingness to Sell LPG Based on Knowledge of the Product



The reasons for traders' unwillingness to stock LPG are shown in Figure 6.31. Traders are concerned about the profitability and lack of a customer base for LPG, and also expressed general concerns about the product's flammability. They were also concerned that they lacked the financial means to acquire sufficient LPG stock for re-sale (given that most traders paid COD for the fuels they bought).

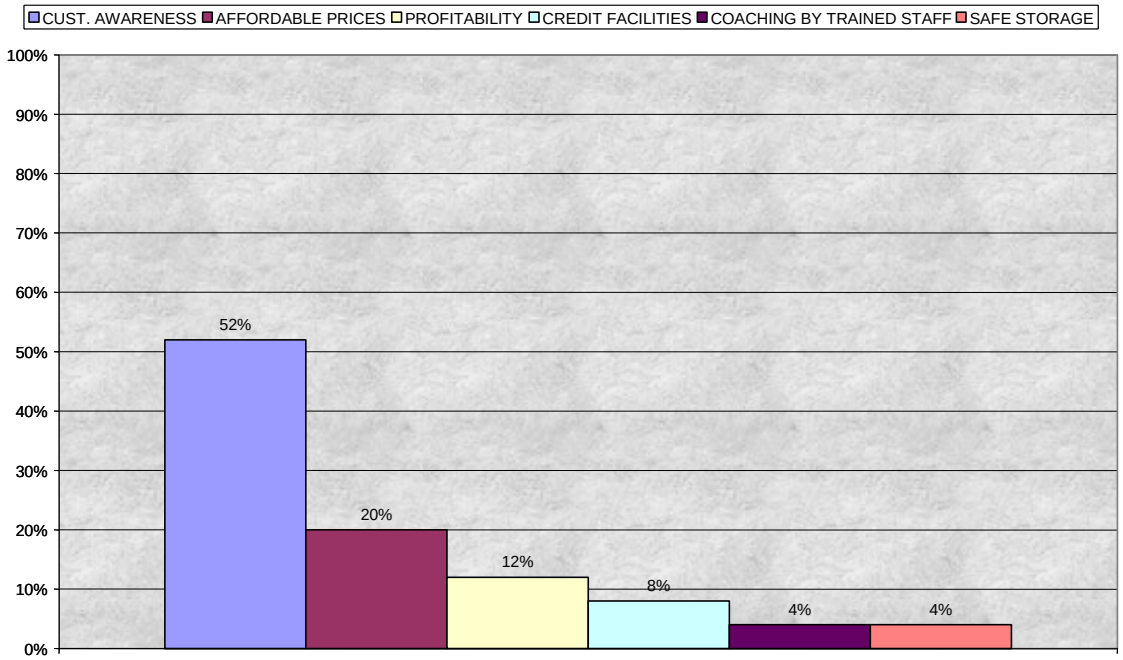
Figure 6.31 Reasons for Unwillingness to Stock LPG



6.6.7 Requirements for Successful LPG trading

Fuel traders feel that there is a need for extensive customer awareness campaigns if LPG is to supplant other traditional fuels. The attributes perceived by fuel traders as important for successful marketing of LPG is shown in Figure 6.32. Surprisingly, despite the concerns about the high cost of LPG, only about 8% of respondents suggested that some form of credit facility could be extended to traders and consumers alike to promote LPG.

Figure 6.32 Attributes Important for Successful Trade in LPG



6.7 FOOD VENDOR MARKET SURVEY RESULTS

6.7.1 Fuels Used by Vendors

Food vendors are typically businesses with multiple product offerings. But around 60% of the traders polled generated 50% or more of their total income from the sale of prepared meals (see Figure 6.33). Given this significant amount of income for sale of prepared food, traders are very sensitive to the fuel used for cooking. Businesses use fuels interchangeably depending on their suitability for instant and/or prolonged cooking, heating and illumination purposes (see Figure 6.34). Of the 24 food vendors surveys, only 3 were actually using LPG. These users of LPG stated that they often use LPG (along with other fuels).

Figure 6.33 Vendor Income from Food as % f Total Income

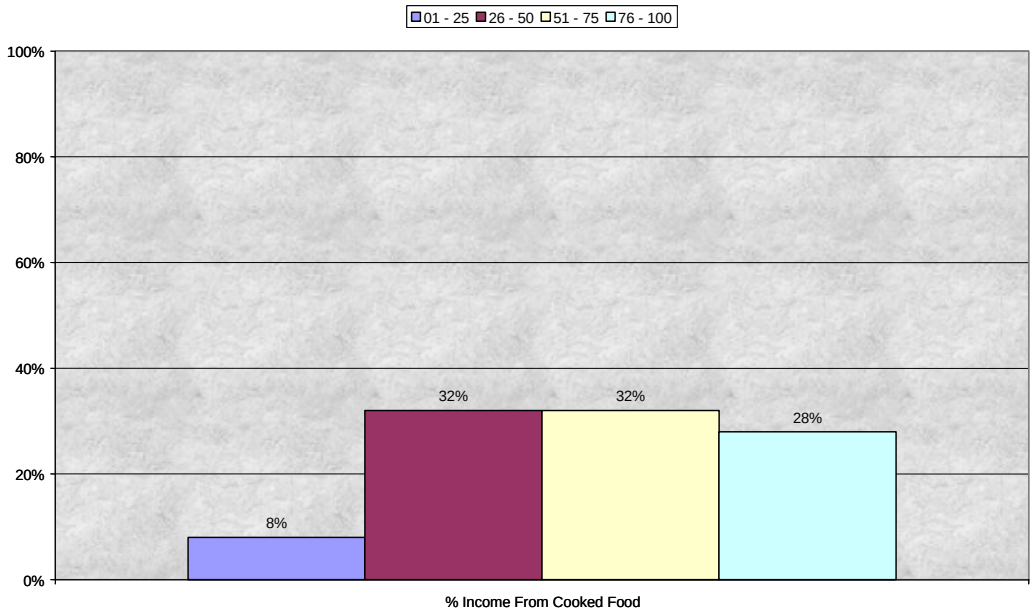
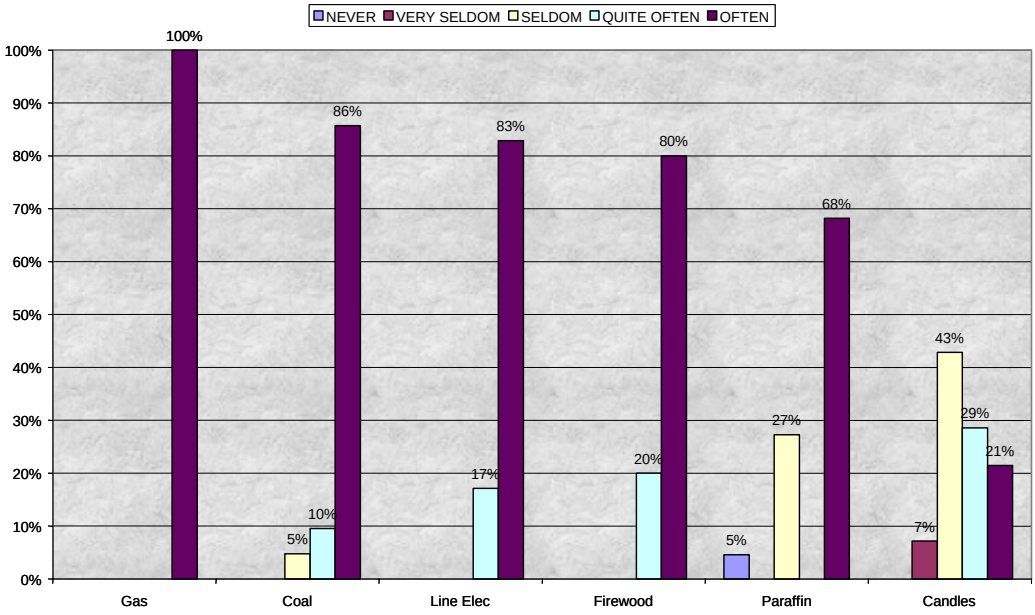


Figure 6.34 Fuels Used by Food Vendors



6.7.2 Consumer Credit

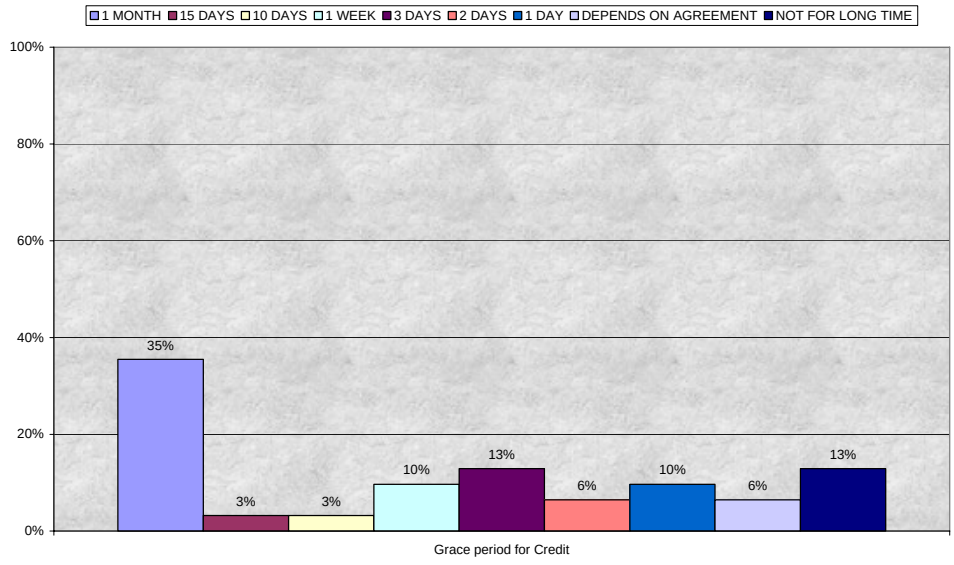
The surveys indicate that the use of credit is fairly widespread, with a third of all traders indicating that they extended credit to their customers in some form or another. In most cases, the commonly extended credit amounts are 5,000 MZM, 10,000 MZM and 100,000 MZM, and about 10% of customers receiving open credit (no limit). Table 6.6 shows the breakdown of

credit extended to customers. The credit is generally extended for a period 30 days with an apparent element of flexibility in these terms (see Figure 6.35).

Table 6.6 Credit Extended to Customers

Credit Amount (MZM)	% of Total Credit
3,000	7%
5,000	10%
6,000	3%
10,000	13%
15,000	7%
20,000	7%
50,000	3%
60,000	3%
80,000	3%
100,000	17%
150,000	7%
250,000	3%
300,000	3%
1,000,000	3%
No Limit	10%

Figure 6.35 Typical Credit Grace Period Extended by Traders to Customers

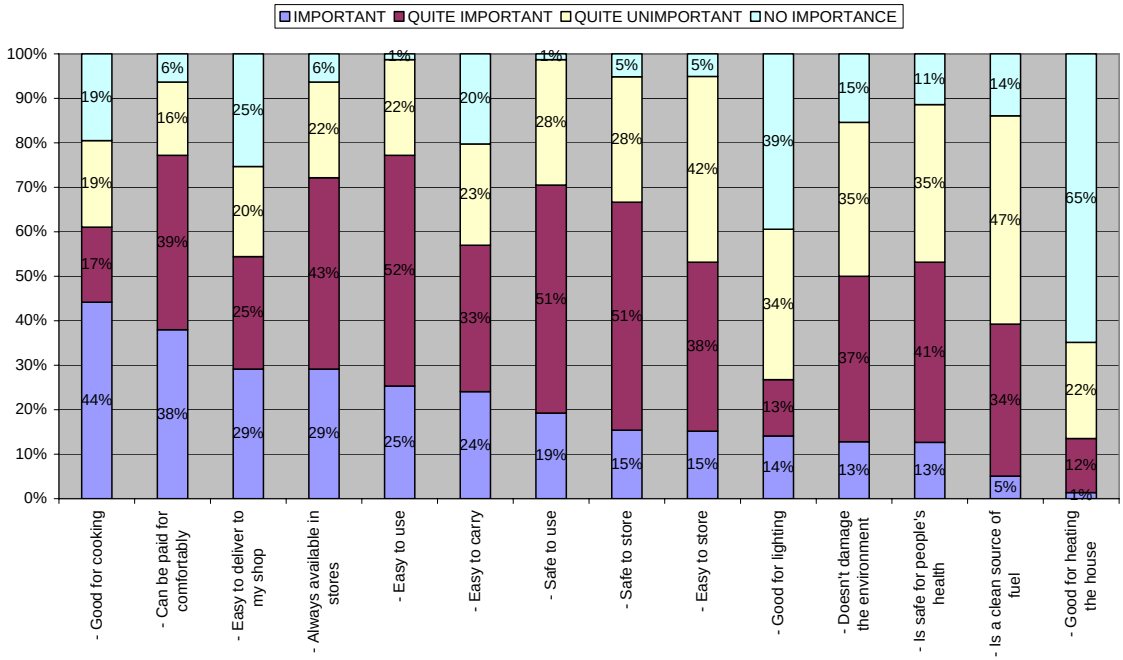


6.7.3 Analysis of Fuel Attributes

Traders were asked to indicate and rank the relative importance of different attributes of all fuels in general and for LPG in particular.

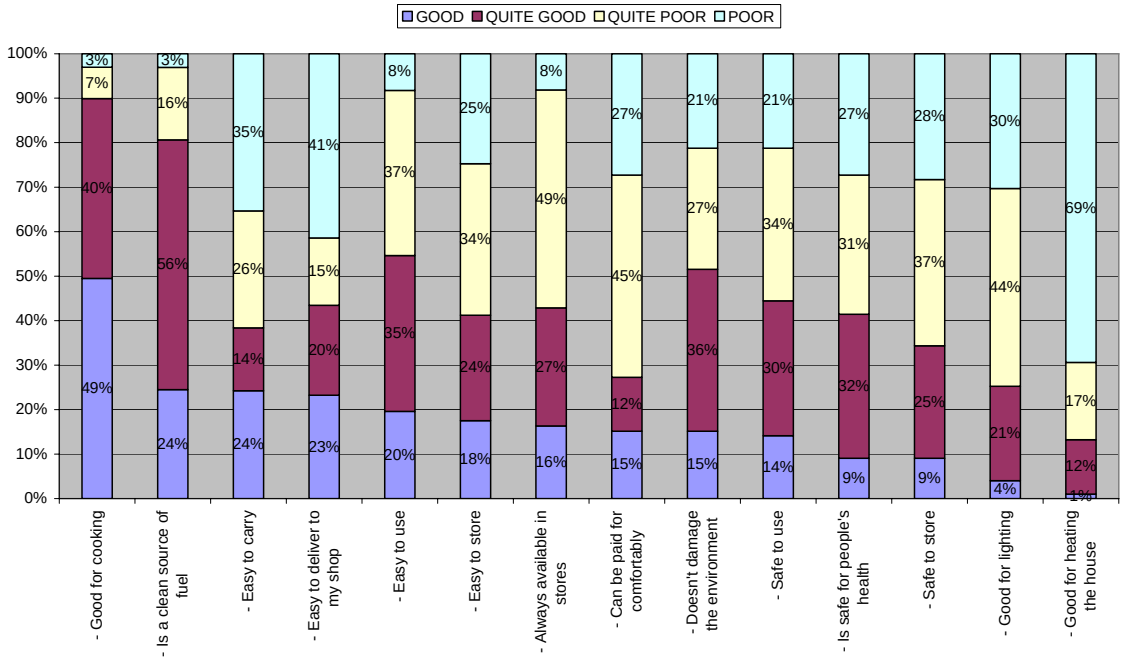
Forty four percent of traders indicated that the most important attribute of a fuel was that it be good for cooking. About 38% regarded affordability of fuels as important and 39% regarded this as quite important. On the other hand, 29% of traders noted availability of the fuel type and ease of delivery to their trading outlets as quite important, and 52% indicated that ease of use was quite important (see Figure 6.36).

Figure 6.36 Important Attributes of Cooking Fuels



When asked to similarly rank the important attributes of LPG, almost 90% of the respondents indicated that it was good or very good for cooking (see Figure 6.37). Most other factors (e.g. ease of delivery, portability, health and environmental considerations, cost and availability etc) were considered less important than LPG's perceived value for cooking, although LPG's attribute as a clean fuel was considered quite important by 56% of the respondents and as important by a further 24%.

Figure 6.37 Important Attributes of LPG as a Cooking Fuel



Traders also ranked then important attributes of fuels and compared it to the satisfaction gained from use of LPG. LPG was ranked high on satisfaction as a cooking fuel but was ranked lower on many other attributes relative to the score given to fuels in general (see Figure 6.38). The ranking scale was:

Rating of Fuel Attributes

- 1 to 2 = Low to quite low
- 2 to 3 = Quite low to quite high
- 3 to 4 = Quiet high to high

Attributes with ratings of 3 and above thus indicate important considerations for customers.

Rating of LPG Attributes

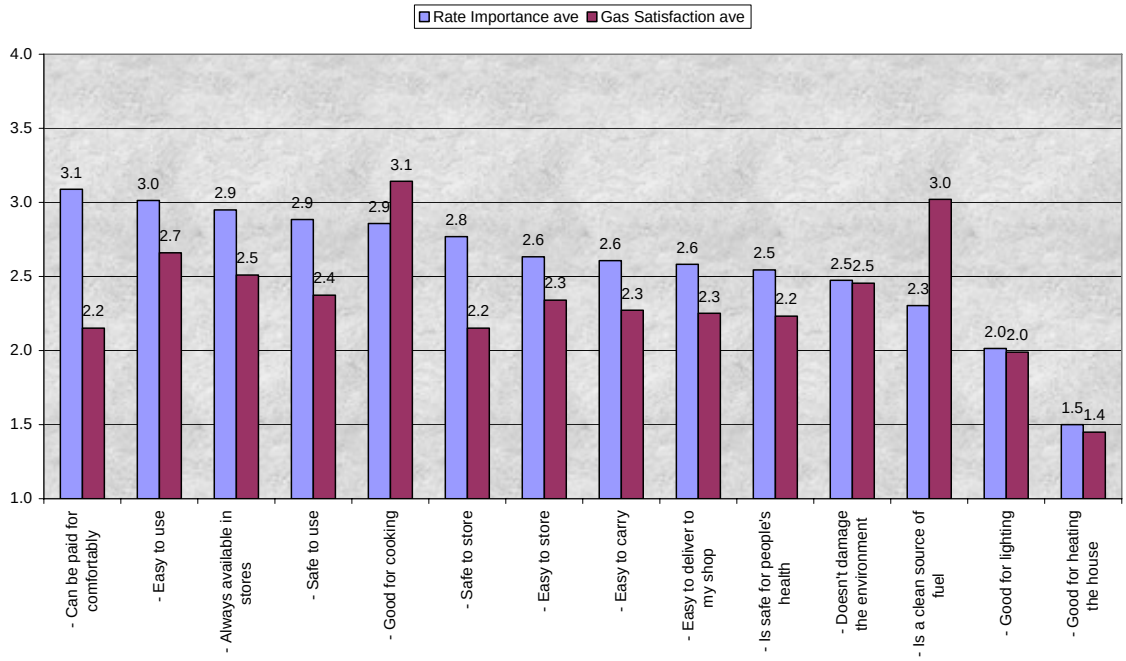
- 1 to 2 = Poor to quite poor
- 2 to 3 = Quite poor to quite good
- 3 to 4 = Quite good to good

Thus ratings below 3 indicate a somewhat negative perception of the value of LPG as a fuel.

The fact that most of the other factors (e.g. ease of delivery, portability, health and environmental considerations, cost and availability etc) attracted considerably lower scores than that attached to LPG's use for cooking, suggested that traders were either ignorant of LPG's

other benefits or were not convinced of them. This would again suggest an opportunity to boost LPG usage by highlighting its numerous benefits.

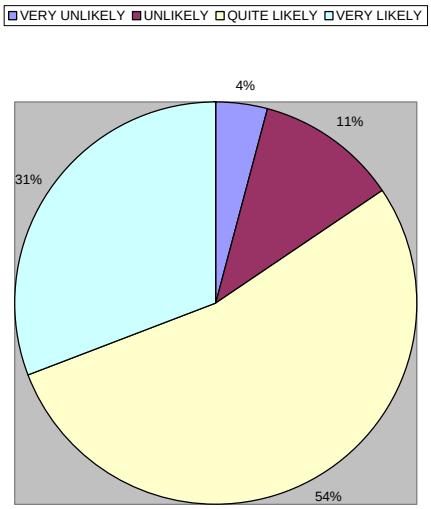
Figure 6.38 Importance of Fuel Attributes Vs. Satisfaction with LPG



6.7.4 Willingness to Use LPG in outlets

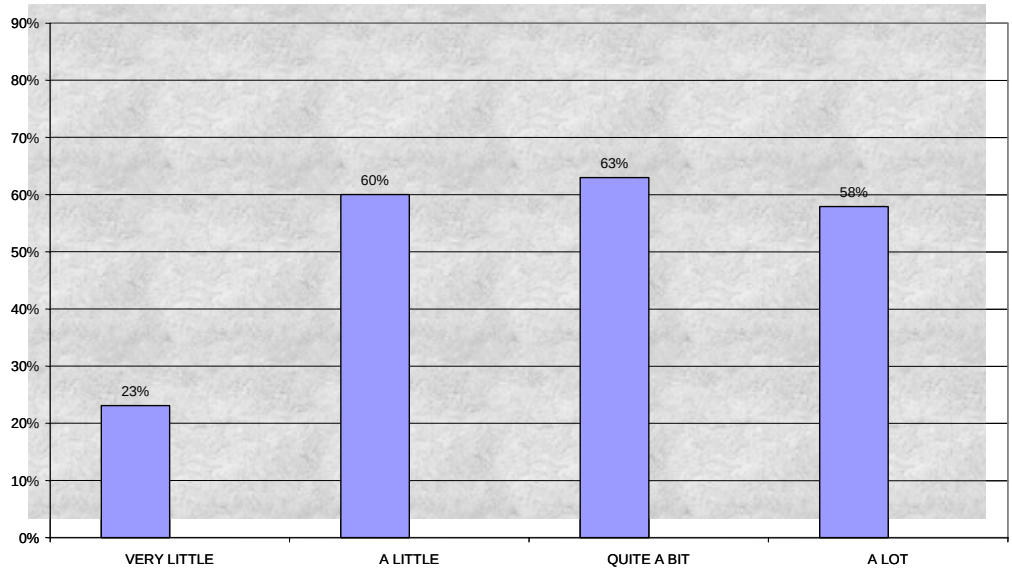
All traders are quite keen to use LPG in their businesses, and among those not presently using LPG, 54% indicated that they were quite likely and 31% indicated that they were very likely to do so. Those who had greater knowledge of LPG were also more willing to use LPG in their stores (see Figure 6.39).

Figure 6.39 Willingness to Use LPG



Vendors willingness to use LPG correlates very well with their knowledge of LPG as a fuel (see Figure 6.40).

Figure 6.40 Vendors Willingness to Use LPG Based n Knowledge of LPG

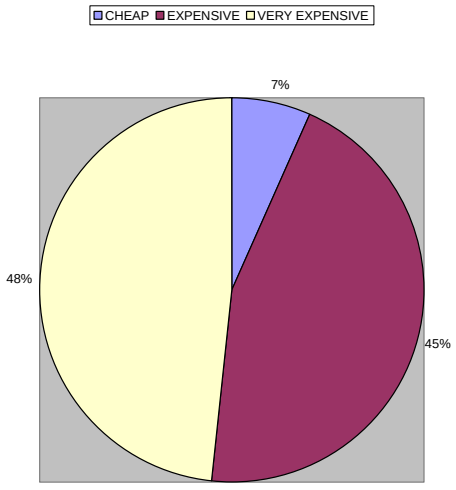


6.8 FUEL TRADERS AND FOOD VENDORS

Fuel traders and food vendors both generally perceive LPG as a very high cost fuel option (see Figure 6.41).

Traders and consumers alike would have to be convinced of the relative benefits of LPG versus other fuel types before they can be convinced to adopt LPG. Marketing strategies should thus be designed to address this key concern and highlight the value and benefits of LPG.

Figure 6.41 Perceived Cost of LPG Among Fuel Traders & Food Vendors



Section 7 Conclusions from Market Surveys

7.1 KEY FINDINGS AND CONCLUSIONS FROM SURVEYS OF CUSTOMERS IN PEMBA

The market for fuels in Pemba is essentially comprised of two distinct geographic areas, one urban and the other peri-urban. The customer market surveys point to the following key characteristics:

7.1.1 Household Characteristics:

Respondents in peri-urban areas are characterized by households where income is low, families are large with many dependants (generally between 6 and 8 members in a family), and unemployment is high and expenses have to be carefully budgeted. On the other hand, respondents who lived in the urban parts of town had higher incomes and belonged to smaller nuclear families with fewer economically dependent individuals.

Monthly household income ranged between US$ 25 to a little over US$ 500. Typically, most of the respondents who lived in the peri-urban areas came from households with incomes between US$ 25 and US$ 250. Only very poor households indicated that their monthly household income was less than US$ 25 (less than 1% of the respondents in the consumer survey). In contrast, many of the respondents who lived in the urban parts of town had higher incomes (often more than US$250) and belonged to relatively smaller nuclear families with fewer dependents. Except for a few urban dwellers, very few people own a private vehicle. Residents tend to walk or use public transport.

The head of the household, the spouse, the eldest child or other adult living in the household typically make fuel purchase decisions. The decision is based on the household's fuel budget and the decision maker generally decides when, where, and what fuels should be purchased. Overall, respondents are very cautious about their expenditure on fuel since their meager income has to support other essential necessities such as food, clothing, health, education, etc. So when faced with the decision on the fuel to purchase, most households want a fuel that is good for cooking but is also affordability, easily and conveniently available, is easy and safe to use, and is versatile in its application.

Tourism and related industries appear to be the main sources of economic employment among survey respondents. Some worked in the public sector, and others were involved in farming or running small family businesses. Unemployment is higher among peri-urban households, and unemployment among women is higher in general.

The level of education strongly influences customer's perceptions of LPG. In urban areas, which have a higher concentration of educated and relatively affluent respondents, many respondents have had prior experiences with using LPG products and are thus very aware of the benefits of LPG. This is clearly less so in peri-urban areas where the level of education and exposure to modern conveniences is lower.

7.1.2 Fuel Use in Households

Most respondents bought fuel primarily for cooking and illumination purposes. Most urban respondents typically use a combination of electrical power (largely provided by EDM, but battery power is also used) for illumination at night and charcoal or LPG fuel for cooking. These respondents, unlike those in the peri-urban areas, almost never use kerosene for illumination and firewood for cooking.

In the peri-urban areas, candlelight was the most common form of illumination fuel and charcoal the most common cooking fuel. While use of firewood was once widespread among consumers in Pemba, its popularity has declined and most consumers have switched to charcoal because it is perceived as more economic, healthy and modern. Only the very poor in these communities still use kerosene for illumination and firewood for cooking. In fact some of the highest users of firewood are not individual households but retailers engaged in the sale of traditional beer and local bread.

7.1.2.1 Charcoal:

Charcoal is by far the most commonly used fuel among respondents in both the urban and peri-urban parts of Pemba. Some of the reasons citied for its popularity were that it burnt efficiently, was widely available in areas where consumers normally shop, was easy to carry/transport and was relatively inexpensive. Charcoal is used for cooking, ironing and to provide warmth in winter. About 90% of respondents own a charcoal stove and some 60% own a charcoal iron.

7.1.2.2 Electricity:

Electric supply though unreliable, is widely used in 79% of households. The use of electricity has become popular since the government announced plans to supply Pemba with electricity from the Cahora Bassa hydroelectric power plant. Electricity is used for lighting, to operate television sets, and electric irons. However, the widespread use of electricity is more common in the urban areas. Electricity is also used for cooking – some 29% of households reported owning an electric stove – but its use is limited due to the price of electricity. Electric stoves are more often used for limited cooking needs and especially to quickly heat water for tea.

7.1.2.3 Candles:

Candles are also very popular for lighting, especially among households who cannot afford to pay for electricity or kerosene and LPG lanterns. Of course candles are used for lighting among all households during the frequent power cuts in Pemba.

7.1.2.4 Paraffin:

Paraffin is used primarily in lanterns for illumination. While respondents in the focus group meetings has voiced their concerns about paraffin as a fuel and its overwhelming smell and fumes that could be hazardous to health, some 45% of households still own and at times use paraffin lanterns.

7.1.2.5 Firewood:

Though firewood is considered to be a cheap cooking fuel by all the respondents, many households said they use it far less frequently than charcoal when preparing meals because it was less efficient, not clean and an "old-fashioned" fuel. Only poorer consumers and some traders involved in baking and making traditional beer regularly use firewood. Firewood is also used by some of the some hotels and guesthouses for heating bath water.

7.1.2.6 Liquefied Petroleum Gas (LPG):

LPG is not widely used by the respondents of the survey – about 22% of households reported using LPG, and these generally constitute affluent domestic consumers and retailers/vendors involved in selling cooked food. While many respondents were aware of LPG as a fuel, very few knew anything about the fuel. A very large percentage of respondents believe that it is a dangerous or toxic fuel, and many believe it is expensive. It is only the actual users who see clear benefits of using LPG. Among the household that use LPG, nearly two-thirds of them use LPG daily and for most of their cooking needs, and another 20% use it 3 to 4 times a week. About 7% of households indicate that while they use LPG, they use it once a week or less. The frequency of use is a function of both affordability and cooking habits and customs. Some foods are traditionally cooked outdoors on charcoal stoves.

7.1.3 Consumer awareness about LPG:

LPG is primarily used by affluent households and food vendors/retailers. While 88% of respondents were aware of LPG as a fuel, very few knew anything about the fuel. Among those who claimed to have heard about it, almost 50% lacked an understanding of the product and the remaining had very limited knowledge about the product.

In fact, when asked their perception of LPG as a fuel, only about 20% chose to respond to the question. A very large percentage of respondents (79%) believe that it is a dangerous or toxic fuel. It is only the small percentage of actual users who see clear benefits of using LPG. Over 50% of respondents who chose to respond had concerns about the fuel's price.

Urban respondents tended to be more aware of LPG as an alternative fuel source and had had more experience with its various uses (e.g. for illumination, cooking, refrigeration, etc.) than was the case with respondents from the peri-urban neighborhoods. This might be due to the fact that there is a higher concentration of educated and affluent people (local administrative staff, foreign and regional technical staff who are in Pemba on short term work and business assignments) who have had prior experiences with LPG products and can afford to buy them because their lifestyles demand the use of cleaner fuels than the commonly used candles, kerosene lanterns, charcoal and firewood.

Urban respondents' higher LPG awareness levels might also be explained by the fact that Pemba has traditionally had serious electrical power shortages and companies that operate there have always tried to attract qualified personnel by ensuring the availability of alternative power sources (e.g. diesel power generators and LPG). In recent times these efforts have coincided with the emergence of local LPG supply companies such as VidaGas whose distribution channels are based in the urban centers of town.

The fact that use of LPG is not hazardous to health (as compared to charcoal) and is an environmentally friendly fuel is not high on the list of attributes that consumers look for in a fuel. Though during the focus group meetings, participants had voiced concerns about the environmental and health hazards of using charcoal and firewood, participants also feel that they are too poor to afford alternative fuels.

- Expenditure on Fuels:

The average monthly expenditure on fuels varies considerably depending on the fuel used by the household. The average monthly expenditure on fuels is as follows: Electricity (battery) - $45.4; Electricity (line) - $43.4; LPG - $15.6; Charcoal - $6.9; Firewood - $2.5; and Paraffin - $2.3. The expenditure on electricity is obviously higher since it is used for a variety of end-uses. The expenditure on LPG is more than twice that on charcoal, and clearly firewood is the cheapest cooking fuel. Among households that use LPG, monthly expenditure varies from about $8.8 to $17.0. The average expenditure varies based on the frequency of use and because households do not exclusively use any one fuel for cooking. Most use a mix of fuels that includes charcoal, LPG and some electricity.

The expenditure on LPG as a percentage of income is varies significantly based on the income group of the targeted customer group. For over a quarter of the respondents whose household income is in the range of $25 to 125 per month, LPG is clearly an expensive fuel option that they cannot afford. For over 50% of the households whose monthly income ranges from $125 to $375, LPG is still expensive at between 4-12% of income, but these households could be targeted for conversion to LPG for at least part of their cooking needs. For the remaining 25% of the population, use of LPG is a financially viable option and, is in fact, the population group that regularly uses LPG.

- Availability and distribution of LPG:

LPG is not readily and easily available across the township. While customers can pick up gas at the VidaGas filling depot or at the retail outlet or at one of the distributors, on average, some 50% of respondents feel that LPG is not easily available. This percentage is higher in peri-urban areas where 60% of respondents felt that LPG is not readily available.

Only about 36% of respondents knew that LPG was available through VidaGas. Clearly this is weighted by respondents in peri-urban areas who do not generally come across the VidaGas retail store. While GULP LPG is available through their petrol stations very few respondents knew about this.

Customers are also sensitive to the availability and ease of purchasing a fuel. When shopping, peri-urban respondents are more likely to walk or use public transport than their urban counter-parts. Since LPG stores are not easily seen in the marketplace, especially in peri-urban areas, the product is perceived to be difficult to obtain and targeted primarily at select urban residents.

- Consumer Willingness to try LPG

Despite the negative perceptions about LPG, 8 out of 10 respondents would be willing to use or try LPG if more information on LPG and appliances were readily available. This implies that price is not the only major deterrent. Though household incomes are low and LPG costs are

high, it is the perception of the price of LPG and the poor knowledge of the product that dissuades households from using LPG. This indicates an enormous opportunity to market the product.

In making a decision on the fuel to be used, respondents indicated that the most important consideration was the suitability of the fuel for cooking. Once this was determined, consumers then judged the fuel in terms of its affordability, availability, convenience, ease of use, safety, their familiarity with it and the versatility of its applications.

- Perception of Price

With the exception of affluent urban respondents, most respondents feel that LPG is a very expensive fuel and LPG appliances are expensive. This perception is less so among customers who presently use LPG, but these generally tend to be higher income households.

Though LPG is an expensive fuel option for many residents of Pemba (as indicated earlier), customer's negative perception of price is clearly influenced by household, but is also largely a result of poor knowledge of the product and a lack of customer education and awareness programs. The LPG companies are very reactive in their approach and have made no effort to tap in to a segment of the population that could potentially be influenced to use LPG.

The demand for fuels such charcoal, firewood and paraffin will of course reamain among very poor customers. But there is a segment of the population that remains loyal to traditional fuels despite their awareness of the detrimental health and environmental impacts of these fuels. While some of this can be overcome with customer education, a certain segment of society might continue using traditional fuels even if they can afford to purchase LPG.

- Creating Awareness of LPG:

Survey respondents were also asked to comment on their opinion on how LPG could best be promoted in the marketplace. Obviously opinions this varies from urban to peri-urban areas and within income groups. About 40% of respondents felt that creating awareness and advertising the benefits of LPG through television advertisements would be effective. Over a quarter of respondents felt that word-of-mouth advertising would be effective, and another quarter felt that signs and billboards are the best means to advertise the product. Clearly, all these approaches are needed to effectively disseminate the message to different sections of society.

Households generally use multiple fuels for cooking based on the food being cooked and fuel costs. Customers using LPG typically also use charcoal for cooking.

Customers clearly have very limited knowledge about LPG and there was a general negative perception towards LPG. This perception was strong among people who had never used the product than among those that had. Most of these people are fearful of LPG's potential handling risks health hazards and costs.

Most respondents mentioned price concerns, product safety and availability in outlets within their neighborhoods as factors that prevented them from purchasing LPG cylinders, stoves and other accessories.

Despite their poor knowledge and perception of this fuel, a very large proportion (some 80%) indicated their willingness to use LPG under the right conditions.

A concerted campaign to promote LPG is critical to educate customers about the benefits of LPG. Thus awareness campaigns and marketing strategies focused on key customer considerations is key to the increased penetration of LPG in the marketplace.

7.2 KEY FINDINGS AND CONCLUSIONS FROM SURVEYS OF FUEL TRADERS AND FOOD VENDORS

This target group of respondents represented fuel suppliers and retailers who sold cooked food or traditional beer to the public. Most of the retailers that sold cooked food were wealthier, better educated and operated their businesses from relatively modern premises, and the regular clientele ensures a steady income stream. This contrasts somewhat with the average fuel retailer, who is generally a small operator dealing in multiple products including fuels.

Charcoal and firewood wholesalers were also targeted. These traders operate their business from specially designed mud and thatched roof warehouses. These businesses are started using retirement funds, savings, and loans from relatives. It is common for these wholesalers to run two business operations in which profits from one supported the less successful venture. They were singled out in this study because they have influence over vital networks of well established and strategically located smaller retailers whose businesses are scattered throughout Pemba and are often located within walking distance of most households in the peri-urban areas.

Traders who trade in charcoal, firewood and candles are more common in the peri-urban parts of town. The most dominant group of fuel traders within the peri-urban informal market sector are the charcoal wholesalers. These traders typically stock huge amounts of charcoal and some firewood. The charcoal is sold to retailers as well as directly to customers. Firewood is normally purchased by poorer consumers who perceive charcoal as an uneconomic alternative to firewood and by food vendors who value firewood for baking local bread and preparing traditional beers.

Many traders regard their businesses as more than just a profit-oriented commercial activity. Their business represents to them a way of life that provides sustenance and creates employment opportunities in a town that has a relatively high cost of living and widespread unemployment. It is not uncommon for traders to promote their businesses by accepting barter trade or making credit concessions to trusted clients.

Vendors selling food and traditional beer do well because of the town's tourism industry and are thus important players in the fuels market. These retailers influence the fuel's market prices since they regularly purchase large volumes of fuel to meet the high market demand for their products. In peri-urban areas where outlets stayed open all night the demand for charcoal, firewood, candles, kerosene and electricity is particularly high.

The results from the traders' survey showed that most food vendors use a combination of fuels such as LPG products, charcoal and firewood. These businesses include outlets such as hotels, restaurants and guesthouses located in the urban parts of Pemba where LPG is available.

Fuel traders are of the opinion that the best selling fuels are charcoal (38 %), firewood (34%), paraffin (14%), candles (12%). Most traders did not sell LPG and thus had little knowledge of it sales potential. The opinions on fuels with the most sales potential is clearly influenced by the fuels that make the most profits for the traders, which is generally seen as combination of the markup on the fuel and the sales turnover based on volume of sales. Only 16% of traders feel that the markup on a fuel alone makes for profitability with the remaining reporting both sales volume and a combination of sales and markup as important to their business.

Fuel retailers generally pickup the fuel from the wholesale dealers, with the exception of LPG which is generally delivered to the retailer by the LPG company. A vast majority of traders pay cash-on-delivery for fuel supplies.

Over half the traders know little about LPG and perhaps stemming from their poor knowledge of the product, a vast majority of traders are uncomfortable with the idea of storing LPG on their premises since they perceive it to be dangerous or requiring special handling.

50% of traders were willing to sell LPG. But the lack of knowledge of the product, negative perceptions about safety, and the perception that there is no demand for the fuel keeps the traders from stocking LPG.

Over half the retailers feel that customer awareness and education is the key to LPG sales and only about 20% feel that affordability would be an issue.

The traders are to some extent aware that charcoal, firewood and kerosene fuel have harmful effects on the environment and people's health, but do not understand the extent of the problem. For many of them, concerns about their daily survival are of greater importance than protecting the environment.

Retailers commonly provide credit to their customers to purchase cooked food or fuels. The amount of credit varies depending on the relationship the clients have with the retailers. Regular clients are generally given credit. While most credit is given for a period of 15 days or less, a little more than a third of the credit extended to customers is for up to a month.

It is important to recognize that fuel retailers in Pemba are small business that stock small quantities of fuel and primarily provide a basic means of sustenance to the retailer. Even many of the wholesalers are relatively small operations that cannot afford to make huge investments. LPG companies will have to create a whole new type of distributor who can represent the LPG company, and make investments to stock and transport LPG. Also, the fewer the links in the distribution chain, the fewer the added margins to a relatively high priced product.

LPG has good potential for adoption by the trade segment in Pemba. Much of the probable success of the product would stem from effective consumer education programs and increased product awareness campaigns at both trade and consumer levels. Consumer product trials would also be very useful in generating the proposed awareness efforts. Finally, a comprehensive product price sensitivity assessment would provide better insights into how price changes might influence demand for LPG products in Pemba.

Given the widely prevalent perception that LPG is an expensive fuel, traders and consumers alike would have to be convinced of the relative benefits of LPG versus other fuel types before they can be convinced to adopt LPG. Marketing strategies should thus be designed to address this key concern and highlight the value and benefits of LPG.

Section 8 VidaGas Operations

8.1 OVERVIEW OF VIDAGAS

VidaGas is a private for-profit LPG company incorporated about two years ago. The company was set up by VillageReach and its Mozambican partner, the Foundation for Community Development (FDC). VidaGas was initially established to support a healthcare project in the Northern province of Cabo Delgado, and initially supplied the Mozambique Ministry of Health with LPG for powering essential equipment in health facilities. It later expanded its supply to other customers including restaurants, tourist lodges and hotels in or near Pemba (the capital of the Province), and a commercial prawn operation. It is presently the primary supplier of LPG in Pemba (one other company has decided to pull out of the market and another company has an insignificant share of the market).

VidaGas now wishes to target households and small and medium enterprise (SMEs), mainly in the barrios, or residential urban and peri-urban sections of the city. VidaGas has thus begun to establish a retail network, including urban and rural retailers, and recently opened a store centrally located in the city. In addition to LPG and storage canisters, VidaGas offers a range of LPG-powered appliances including lamps, cookers, refrigerators, freezers, and sterilizers.

8.2 LPG SUPPLY AND MARKET

The LPG distributed by VidaGas is all imported from South Africa via IMOPETRO, a throughput provider also in charge of stock control and allocation of the imported LPG quotas to the member companies. The LPG is delivered by ship from Maputo to the port in Pemba.

VidaGas initially supplied LPG to 36 clinics in three districts to support the Ministry of Health's vaccination program. When the company decided to expand its services beyond health services, it easily picked up large commercial and industrial consumers in the area. A few households have also signed up for LPG. However the company has made little inroads in to the smaller household and SME market. This is primarily due to the lack of clarity in its mission – conflict between being a for-profit company and providing energy services to poor customers with very low levels of consumption.

The company's operations in the Province of Cabo Delgado covers only a few Districts of Pemba such as Pemba Metuge, which is about 45km from Pemba; Quissanga at 115 km; Macomia at 210 km and MontePuez at 200 km from Pemba. Some of these places are accessible only through non-paved roads.

VidaGas has one industrial customer, the local prawn processing plant, which is supplied gas in 45 kg cylinders. The company also serves 12 commercial consumers – 7 hotels and 5 restaurants. The company also has a few domestic consumers of LPG who are supplied gas in 5.5 kg cylinders. The company has set up store in the town to distribute and market LPG cylinders and appliances. It is also beginning to set up a dealer network to distribute gas, which includes the largest appliance dealer in the town.

To meet the above demand for LPG, the company on average ships one 9-ton container every 4-5 weeks. The current market for LPG in Pemba is really small and while sales have gone up to about 8 tons per month, the average demand for LPG in 2004 was only about 5 tons per month.

8.3 LPG OPERATIONS AT VIDAGAS \ PEMBA:

8.3.1 The Filling Station

The company has one filling plant in Pemba, which is equipped with the basic minimum equipment necessary to fill the 45 kg gas cylinders and smaller 5.5 kg bottles. The LPG container from the port is trucked into the premises of the filling station and a pump and multi-purpose scalar are used to fill cylinders. The storage capacity can meet about 75 days of demand, but due to logistical problems of getting the LPG container from Maputo, the storage capacity can meet the demand for about 30 days only.

8.3.2 Organization & Human Resources

VidaGas employs a total of 8 persons at the filling plant, and 2 more persons are employed in the showroom/retail store. The number of people employed at the filling station appears to be large given the scale of operations.

Availability of qualified personnel to efficiently run the operations is a major constraint. Qualified persons are not easily available in Pemba and it is difficult to persuade qualified people, say from Maputo, to move to Pemba. The low volume of sales and associated low revenues to offset costs of well-qualified and trained personnel exacerbates the problem.

8.3.3 Marketing & Sales

It appears that no attempt has been made to promote LPG as an efficient alternative fuel that can potentially replace charcoal and firewood even in relatively low-income homes. The company does not have an advertisement or marketing campaign to proactively market the product to customers, nor has it used opinion makers to mobilize the brand. Customers are essentially supplied LPG upon demand.

8.3.4 Cost Structure

As described earlier, the delivered costs of LPG in Pemba are very high – adding about 170% to the price at Maputo. Several other cost components are then added to this resulting in customer prices that are very high – for instance, the delivered price of a 5.5 kg cylinder is almost two times that in Maputo.

8.3.5 Other LPG Suppliers

Apart from VidaGas, Petrogás and Gulp are the other suppliers of LPG in Pemba. Gulp distributes 11 kg LPG cylinders, which are filled at a filling plant in Beira operated by Moçacor. The logistics of this operation are complicated and expensive since the distance from Beira to Pemba is about 1500 km. Gulp uses its gasoline stations as outlets for the 11 kg cylinders. Petrogás sells both 11 kg and 45 kg cylinders. However, the company is considering leaving the local market due to insufficient sales that makes it hard to breakeven on costs.

Section 9 Development Plan for LPG Companies

9.1 MARKET POTENTIAL FOR LPG IN PEMBA AND NORTHERN REGIONS

The industrial and large commercial clients in Pemba have largely been tapped. Thus future growth in Pemba will have to come primarily from households and small and medium commercial establishments. There are about 20,000 households in Pemba, of which an estimated 10% fit the income profile that can switch to LPG. Households switching to LPG would use an average of 5.5 kg per month. This presents a potential of some 11 tons per month. The SME's also present an untapped market for LPG sales. It is estimated that SME's present a potential of an additional 5 tons per month. With increasing gas-stove ownership coupled with a very concerted advertisement and awareness campaign the sales of LPG to these segments could be increased substantially. The total market potential for LPG sales in all customer sectors could thus be about 25 tons per month. If the price of refilling a cylinder were lower, the potential for LPG use would be higher.

There are significant opportunities to expand sales by promoting new LPG appliances to the commercial sector. This would serve to create new and increased demand for LPG. For instance, an LPG company could promote the sale of the following appliances to the commercial sector:

LPG operated electricity generators
LPG operated air conditioning systems
LPG operated refrigerators and freezers (this is already being done)
Given that electricity is still in short supply in the region, there is a tremendous opportunity to promote the use of such LPG appliances in the commercial sector. Such appliances are widely available in many parts of the world and have proven to be competitive in price and quality, especially in remote areas. However, it should be noted that the commercial sector in Pemba is small.

Considering other major town centers in the Province of Cabo Delgado, the technical or gross potential could easily be doubled and could be in the range of 50 tons per month. In reality, given the high price and low incomes of the people in the region, the actual achievable potential would be lower.

In addition to Cabo Delgado, there is significant opportunity to expand the market to the neighboring province of Nampula and Niassa. Based on demographic data, the technical or gross potential for LPG sales in Nampula/Niassa could well be in the region of 100 tons per month.

Combined, the three provinces present a gross technical potential of some 150 tons per month. The achievable market potential may be about 100 tons per month. At present, the actual demand is a fraction of this estimated potential due to the various reasons discussed earlier.

The fact remains that if an LPG company is serious about expanding the market base and increasing demand, it has to aggressively pursue all opportunities and options and forcefully and persuasively market the ideas.

9.2 ANALYSIS OF LPG PRICE STRUCTURE IN PEMBA

One of the key factors limiting the growth of the LPG market in Northern Mozambique is the high price of LPG. The table below compares the costs and prices in Pemba and Maputo.

Cost Component	Pemba (US$/ton)	Maputo (US$/ton)
Maputo CIF price	238	238
Maputo to Pemba freight cost	407	0
Distribution company margin	650	282
Retailer's margin	155	125
Customer's price	1,450	645
45.0 kg cylinder price	65.00	29.00
11.0 kg cylinder price	16.00	7.10
5.5 kg cylinder price	8.00	3.55

It should be noted that the delivered price in Maputo includes VAT while in Cabo Delgado LPG is sold without any taxation. The bulk transport cost to Pemba represents 28% of the final customer price. The other key difference is in the distribution company margin, which is higher in Pemba due to the low volume of sales.

To make LPG competitive with traditional fuels and increase LPG competition, it will be necessary to reduce the final cost to the customer.

In Pemba, the price of a 2-kg bag of charcoal is about US$ 1.00, which is equivalent to 500 US$per ton. Considering the calorific content of LPG and coal and the poor combustion in the typical charcoal burner, LPG may become a competitive fuel at a customer price of about 1,000 US$/ton. Of course, very poor households will continue to purchase charcoal since it can be bought in small quantities when required with a lower outlay of expenditure per purchase. LPG on the other had requires a per purchase outlay of $8.00, which may not be possible for poor customers.

It would be beneficial to examine alternative options for reducing the expenditure per purchase either through a distributed payment plan. The option of selling even smaller LPG canisters (such as 2-kg canisters) could also be considered, based on the economics of introducing these in the marketplace.

9.3 POTENTIAL TO REDUCE PRIMARY FREIGHT COSTS

The town of Pemba is presently receiving bulk LPG transported by sea in 9-ton capacity containers loaded by IMOPETRO in Maputo at a transport cost of 407 US$/ton.

Road transport of bulk LPG by third parties, costs about US$7,605 US$ for 18-ton tanker truck, which translates to a unit cost of 422 US$/ton.

To reduce bulk transportation cost and hence the final price of LPG to customers, one option to consider is investing in transport equipment to be owned by the gas company.
A 20-ton capacity tanker truck will require an investment of about US$120,000. By operating the truck with two drivers it should be possible to perform two round trips per month on the Maputo-Pemba route, and bring down bulk transport cost to less than 200 US$/ton (see Appendix 5). If found viable, this option will reduce the customer price of LPG by 15%.

In the time it will take to expand the LPG market to 40 tons per month, the trucks could be used to offer services to third parties in order to spread fixed costs.

The consideration of such an option can even be employed as a ploy to negotiate a lower rate for bulk transportation of LPG by sea!

Another option that could be considered to reduce bulk transport costs is the use of a higher capacity tank of say 20-tons to transport LPG from Maputo to Pemba by sea. This too would serve to reduce the per unit transport costs.

With increased availability of LPG at a lower bulk transport cost, gas companies would also be in a position to initiate LPG sales in the neighboring province of Nampula, the province with a even higher potential, and also consider the possibility of possible exportation of bottled LPG to neighboring Malawi.

In the longer-term, depending on the merits of the investment returns, companies could also consider inviting other large distributors to share in the investments. The option of a new maritime terminal, probably in Nacala harbor, province of Nampula, could also be considered and studied. A depot with an initial total capacity of some 300 to 400 tons could be used by all distributing companies operating in northern Mozambique and if the sales vision is expanded, can include supply of LPG to markets in neighboring countries.

As the demand for LPG in Mozambique increases, South Africa will not be able to continue as the only LPG supplier and new sources of supply will have to be considered. And a new port facility that meets the demand of the Northern region and perhaps of some of the neighboring countries as described above, could be used by ships to offload part of their load before continuing to the port in Maputo.

Based on international experience, such a depot/facility would require an investment of about US$ 1.0 to 1.5 million. This option should be considered only when the demand in Northern Mozambique goes up substantially and there are well-defined plans to expand sales to neighboring countries, representing sales of about 1,000 tons per month.

9.4 LPG DISTRIBUTION MARGIN

With the present distribution margin of 650 US$/ton, the gross margin from total LPG sales is presently in the range of US$ 5,000 /month, which would not cover LPG companies' expenses. If the LPG companies can substantially increase sales in the province by lowering the price of

LPG, they could meet their operating expenses with a lower distribution margin. For instance, if sales can be increased to about 40 tons per month by lowering bulk transport costs (as discussed earlier) and the distribution margin to about $350 per ton, the gross margin would be about $14,000/month, which would be adequate to cover expenses.

Section 10
Commercial Strategies for LPG Companies

10.1 EXISTING COMMERCIAL STRUCTURE

At present, VidaGas is the primary supplier of LPG in Pemba. The company does not have a real commercial organizational setup. LPG deliveries are made upon customer's request made through the company's telephone or the Pemba depot manager's portable telephone. In other words, the company has a small number of customers and the product is delivered directly to their establishments or houses upon request. Deliveries are done with a small truck with a total capacity of 50-60 cylinders and sometimes the truck goes 200 kilometers to deliver just one 45-Kg cylinder.

It is thus a reactive sales system that relies on clients' requests only. There is thus an essential need to periodically monitor and survey the market to find new customers and develop a strategy to develop the market. In designing the strategy it's necessary to take into consideration the fact that LPG is almost unknown as a source of energy and the majority of households are afraid of using LPG, as borne out by the customer surveys. This reluctance is due mainly to a total lack of knowledge of the benefits of LPG that makes it one of the most widely used energy source all over the world.

10.2 REQUIREMENTS OF A COMMERCIAL STRATEGY

To overcome the present situation where the LPG companies in Pemba are almost unknown entities distributing a product that customers have little knowledge of, the companies have to define and implement an aggressive commercial strategy that meets the short-term and long-term objectives and translates to achieved sales volume, market share and profit.

The commercial strategy has to be based on the following:

- Clear definition of its geographic operational area
- Changing its approach from a reactive attitude to a proactive marketing approach
- Adopting the approach of a company willing to grow through the continuous acquisition of new customers and their retention through regular offering of high quality product, services and technical/commercial assistance.

To make the above possible, the companies have to take the following actions:

- Choose, in every market of its operational area, the right balance between a direct sales structure and a third parties sale structure to assist in the companies' development.
- Hire a team of qualified professionals to understand and evaluate the present situation and accordingly develop the market for LPG through multi-pronged strategies including, education and awareness campaigns, introduction of new LPG appliances

for application in commercial and industrial establishments, and other promotional actions that promote the use of LPG.

- Create a brand image for the companies, that will become their visual identification, present in all of their installations, cylinders, vehicles, employees uniforms and dealers as well.

10.3 EXPANDED SERVICE TERRITORY

To develop the market for LPG and expand sales, LPG companies need to increase their operating territory and remain focused on their objectives.

As a first step, LPG companies should prepare themselves to operate in the towns of Pemba, Montepuez and in the other five towns in the interior of the Cabo Delgado province without considering possible sales in the rest of the province, since these sales are limited and bring no results.

As a second step the LPG companies should consider the expansion of their activities to all the towns of Nampula and Niassa provinces. These provinces have a relatively high resident population, with higher per capita income than the population of the rest of the provinces and therefore represent a larger market potential.

In Nampula province, the towns to be considered are:

Town	**Population**
Nampula	303,346
Angoche	85,703
Ilha de Moçambique	42,407
Nacala-Porto	158,248

Note: data based on 1997 census

In Niassa province, the towns to be considered are:

Town	**Population**
Lichinda	85,878
Cuamba	57,205

Note: data based on 1997 census

The LPG companies should prepare a schedule for expansion of its service territory. Once planned, the companies have to prepare themselves and be ready to provide a regular supply of LPG, through a reliable distribution structure and high quality post-sales technical support. This will inculcate confidence in the product and assuage any doubts customers may have about LPG, and will also help attract new customers. The program should serve as an instrument to promote and disseminate a "culture of LPG" among the populace.

10.4 PROPOSED COMMERCIAL STRUCTURE

The commercial operations of the LPG companies should be based on a mixed sales structure – partly owned by the company and operated with its own personnel, and partly owned by third parties, such as through a retailer's network. The proposed commercial structure in various towns is provided in Appendix 6.

10.4.1 Key Elements to a Commercial Strategy

The possibility of using motorbikes adapted to carry 4 or 6 cylinders of 5.5 Kg capacity, or other cheaper means of transport in place of small trucks should be examined for all the smaller towns in the three provinces. This can significantly reduce the initial investment and reduce the time to breakeven on operations.

In the smaller towns, it is extremely important that the market development policy be focused on increasing direct sales at the depot's retail store. Companies could adopt a policy that charges extra charge for cylinders delivered to customers' households. The suggested extra charge could be about 10% of the final price for a 5.5 kg cylinder.

A simple approach or methodology should be developed to calculate the return on investment and monthly gross profit. This should be shared with all the dealers so that they can monitor and evaluate their success (Appendix 7). This will also help management to establish the minimum sales volume required for operations to breakeven within a specified time period take decision on continuing operations at specific locations.

For its retailers/dealers the LPG companies should examine the possibility of financing the purchase of a distribution fleet (small trucks and motorbikes). This will not only serve as an incentive to the dealer but will also ensure that obsolete and dangerous means of transport that compromise safety and negatively portray the company are not used by dealers. The repayment of such loans could through the retention of a percentage of the retailer's gross margin after a defined grace period that will allow the retailer to break even on operational costs. The LPG companies should also develop incentives for dealers based on the achievement of realistic sales targets.

According to the results of the market research, the average consumption of a family is in the range of 5 Kg/month and therefore all domestic customers should be supplied with 5.5 Kg cylinders, and industrial and large commercial customers with 45 Kg cylinders. The delivery of the first cylinder to the customer should be based on a payment of a deposit. In areas where companies operate through retailers, a percentage of the guarantee deposit could be given to the retailer as a commission – ideally this commission would be paid in LPG and not in cash.

10.4.2 Qualified Technical and Commercial Staff

The companies should hire a team of qualified professionals to understand and evaluate the present situation and accordingly develop the market for LPG through multi-pronged strategies including, education and awareness campaigns, introduction of new LPG appliances for application in commercial and industrial establishments, and other promotional actions that promote the use of LPG.

To promote sales, it will be important to remunerate the sales professionals based on performance; a partly fixed base salary (less than 50% of the total), with the remaining based on achieving defined targets.

Since there are no trained LPG professionals in the region, it will be necessary to hire qualified professionals and train them in all aspects of LPG distribution. Since such specialized training is not locally available, it might be necessary to arrange training in neighboring South Africa or perhaps even Brazil, which like Mozambique is Portuguese-speaking, and has monthly LPG consumption of some 600,000 tons. The exposure to a market with such large demand would be of enormous benefit to personnel and would help them see the larger picture.

Obviously, it will not be necessary to hire and train all the professionals at the same time. A gradual process of admission and training can be in phases to coincide with the company's growth in these other markets.

10.4.3 The Company Image

To promote the companies' image and to make it a recognized brand name in the local and regional market, it is important that all cylinders, depots and vehicles bearing the same visual brand image. The same LPG company brand image should also be used by the dealers and retailers. For the retailer's installations and distribution fleet, the company may decide to share the cost of branding.

10.4.4 Promotional Programs

Before beginning operations in a new town, LPG companies should plan to implement a series of promotional activities that effectively communicate the brand message and the benefits of LPG. The idea is to promote LPG to the point that it is seen as the only viable alternative, and create a demand. This is essential to ensure the successful launch of the product in a new market and to also ensure that sales targets are met as planned. Some of the suggested promotional programs are listed below.

Organize public meetings at the company's or retailer's depots to educate customers about the benefits of LPG, and the proper use and care of appliances.

Provide local community leaders and opinion makers with free LPG appliances to promote and disseminate the brand image and communicate the benefits of LPG. This could include provision of LPG appliances to food vendors who are very visible in the market place and be used to communicate the benefits of LPG as a clean-burning and efficiency cooking fuel.

Promote a "sweepstake/lottery" to distribute, free of charge, a few one and two burner stoves (value ranging from US$ 9.00 to 20.00 per unit)

Distribute to event participants gifts like T-Shirts and caps bearing the company's logo.

10.4.5 LPG Appliance Sales

To increase LPG sales it is essential to disseminate and promote the use of LPG appliances in the marketplace. Considering the per capita GNP of Cabo Delgado, Nampula and Niassa provinces,

the level of LPG appliances sales will remain very low in the absence of practical strategies that promote their use, especially the sales of one and two burners gas stoves.

The lessons learnt from promoting sale of LPG appliances in similar markets in Brazil are pertinent to Northern Mozambique. Some 35-40 years ago, when the LPG companies in Brazil wanted to penetrate the remote interior markets, they decided to finance the cost of purchase of a stove along with a cylinder. To grow the customer base, companies were financing stoves and cylinders to be paid back within a period of 12-24 months. The resultant growth in the LPG market justified these efforts even though there were some defaulted payments.

LPG companies operating in Northern Mozambique would do well to consider adopting a similar scheme to promote the sale of LPG appliances and cylinders to customers who are very sensitive to initial investments and costs. The installment payments should cover the cost of the gas stoves, the cylinders, the cylinder deposit, and the cost of expected defaults.

It should be noted that given current retail prices, there is a significant margin of about $3.5 per 5.5 kg cylinder. Even if the distribution margin were reduced as suggested, companies would still make a margin of over $2.0 per cylinder. This margin justifies the use of such schemes and will cover the cost of defaults.

If such a scheme to finance stoves and cylinders is to be successfully implemented, companies should be prepared to meet the challenge of supplying an enormous number of stoves and cylinders. For instance, to meet a sales target of increasing monthly sales of LPG by 4 to 5 tons, the company and its distributors will need to sell some 700-900 stoves per month. The technical and commercial staff of the company and distributors would thus need to be trained to meet this challenge. The utilization of micro credit facilities through local banks and philanthropic institutions should be explored to finance such a scheme and minimize the impact on the company’s cash flow.

Section 11 Recommendations

This study conducted a market survey among customers and traders in Pemba to assess the various factors that influence choice of fuel and customer perception of LPG. In addition to the market surveys, LPG industry experts also studied the LPG market in Pemba and more broadly, in Mozambique. This included a review of regulations pertaining to LPG operations, imports of LPG in to the country, and pricing of the fuel. The operations of VidaGas, the primary supplier of LPG in Pemba, were also reviewed. The results of the market survey and the review and analysis of LPG markets provided valuable insights, which have been discussed in this report. The results from this study were used to develop strategies to improve sales of LPG in Pemba and, in the long-term, in other Northern Provinces of Mozmabique.

11.1 SHORT-TERM STRATEGIES

Despite some of the negative attitudes about LPG expressed by respondents in the market survey, an examination of the results indicates that significant opportunities exist to increase LPG sales in Pemba. LPG companies need to make a concerted effort to develop the market in other segments, especially the un-served domestic sector. In the absence of a well-defined marketing plan the LPG companies have been unable to compete with traditional alternative fuels used in the area, and have failed to promote business and company brand name.

Some of the key short-term measures that should be considered to expand sales of LPG in the Pemba market include the following.

11.1.1 Consumer Profiling for Effective Marketing

To effectively market LPG to customers, potential consumers must be correctly identified and segmented. The survey results provide valuable insights to the characteristics of households in Pemba, which can be used to determine the consumer segments that can be penetrated with LPG. Clearly, segments of the population that have monthly household income of less than about $100 per month are unlikely to switch to a fuel which would cost about 10% or more of their income. The very high-income households have already been penetrated. But households with incomes in the range of about $200 to $500 per month have not been penetrated and present an opportunity for LPG companies. Small and medium commercial establishments should also be targeted. Customers in these segments are somewhat aware of LPG but do not know enough about the product to make a decision to switch to a new fuel and have many misgivings. Short-term marketing efforts should thus be directed primarily at these customer segments.

11.1.2 Awareness and Education Programs

Effective communications between the LPG companies and their clients are crucial for the successful penetration of the market. While the target population groups are somewhat segmented in their ability to purchase the fuel, the communication strategy should not be directed at a single group of consumers nor should it be perceived so since it tends to alienate some consumers who feel that LPG is a product for rich, urban customers. This fact is borne out

by the focus group meetings with customers and the customer surveys that indicate poor knowledge of the product among customers with no previous experience with LPG.

The market survey indicates that the consumer demands cooking fuels that are efficient, easy to use, convenient, inexpensive, and readily available. In the short-term, given the market structure of LPG in Mozambique and the logistics of transporting fuels to Pemba, there is little that can be done to lower LPG prices. The market strategy should thus focus on how LPG can satisfactorily meet the other factors that influence customer demand for fuels. A marketing strategy that clearly sends this message to customers will capture households and SMEs that can potentially afford to purchase LPG at current prices but are reluctant to do so due to poor knowledge of the product and its benefits.

LPG companies should thus strive to develop clear advertising objectives and communication plans centered on creating consumer awareness and changing people's attitudes towards LPG products and the companies.

While it is important to deliver a consistent message to all customers, it may be necessary to also take a slightly targeted approach at certain customer segments in the lower income households where there is a perceptible price barrier in addition to poor knowledge and misconceptions about LPG.

The market surveys indicate that a combination of advertising and communication avenues should be taken to educate customers. These include word of mouth campaigns (via select wholesalers, retailers and influential members of the community), television advertisements (broadcast on TVM), radio transmissions (on Radio Moçambique), newspapers (Noticias), mobile phone advertising (via Mcell & Vodacom), and strategically located billboards/signage.

11.1.3 Promotional Programs

LPG companies should plan to implement a series of promotional activities that effectively communicate the brand message and the benefits of LPG. The idea is to promote LPG to the point that it is seen as the only desirable cooking fuel, and create a demand. This is essential to ensure the successful launch of the product in new market segments and to also ensure that sales targets are met as planned. Some of the suggested promotional programs are listed below.

Organize public meetings at the company's or retailer's depots to educate customers about the benefits of LPG, and the proper use and care of LPG appliances.

Provide local community leaders and opinion makers with free LPG appliances to promote and disseminate the brand image and communicate the benefits of LPG. This could include provision of LPG appliances to food vendors who are very visible in the market place and can be used to communicate the benefits of LPG as a clean-burning and efficient cooking fuel.

Promote and perhaps subsidize food supply to children in public schools that largely cater to children from poor households. The school could be supplied with LPG to prepare food and at the same time publicize the benefits of LPG.

Promote a “sweepstake/lottery” to distribute, free of charge, a few one and two burner stoves (value ranging from US$ 9.00 to 20.00 per unit). This will create a “buzz” about the product in the marketplace and give it high visibility.

11.1.4 Staff Training

Trained professional staff are essential to implement and achieve the goals and objectives of marketing plans, awareness campaigns and promotional programs. Since there are no trained LPG professionals in the region, it will be necessary to hire qualified professionals and train them in all aspects of LPG distribution. Since such specialized training is not locally available, it might be necessary to arrange training in neighboring South Africa or perhaps even Brazil, which like Mozambique is Portuguese-speaking, and has monthly LPG consumption of some 600,000 tons. The exposure to a market with such large demand would be of enormous benefit to personnel and would help them see the larger picture. Staff do not have to be all trained at one time and the training could be phased to coincide with the LPG company’s growth in the marketplace.

11.1.5 Payment Terms and Micro-credit Facilities

One of the key obstacles to LPG penetrating lower-income customer segments is the price of LPG appliances and the cylinder. While the appliances and cylinders are not entirely unaffordable, customers in this market segment are very conscious of “first cost”. It is the initial outlay of funds required to purchase the appliance and place a deposit on the cylinder, which places a hardship on customers. While cylinder refill costs are not an inhibiting factor for customers in targeted market segments, it is the one-time outlay of funds that is a hardship to customers used to purchasing small quantities of charcoal every few days, which requires a lower outlay of cash for each purchase.

11.1.5.1 Installment payments

Low-income customers live on very thinly stretched budgets and are used to making purchases on credit, and the market survey indicated that it is common for traders and vendors to provide credit to their regular customers. However, it should be noted that this credit is of an informal nature and does not involve any interest payment or fixed repayment terms, and the credit is generally paid back in installments less than a month.

A similar installment payment plan could be instituted for customers who are unable to make one-time payments for purchase of a LPG cylinder refills, which costs about $8.00. Such an installment plan would not only reduce the burden on low-income families but also make the installment payment somewhat equivalent to purchasing small quantities of charcoal, and promote LPG sales among lower-income households.

A key drawback of the installment payment plan as offered by the traders is that they carry the costs till all installments are paid since these are interest-free transactions. This has generally not been a problem since the repayment period is typically less than a month, and the amounts involved are small. Also, traders extend this form of credit to known regular customers. If a similar installment payment scheme were adopted for LPG, someone in the distribution chain would have to carry the cost of credit. The risk of default would not be a major issue LPG since the company/retailer holds a deposit for the cylinder.

It is recommended that LPG companies consider implementing an installment payment plan for refilling cylinders. The potential increase in LPG sales should offset the cost burden. The repayment period for filling LPG cylinders should be no more than a month. A small premium could be added to the installment plan to cover the cost of the program.

11.1.5.2 Micro-credit Facilities

The lessons learnt from promoting sale of LPG appliances in similar markets in Brazil are pertinent to Northern Mozambique. Some 35-40 years ago, when the LPG companies in Brazil wanted to penetrate the remote interior markets, which were populated by poor customers, they decided to finance the cost of purchase of a stove along with a cylinder. To grow the customer base, companies were financing stoves and cylinders to be paid back within a period of 12-24 months. The resultant growth in the LPG market justified these efforts even though there were some defaulted payments.

The LPG companies in Pemba would do well to consider adopting a similar scheme to promote the sale of LPG appliances and cylinders to customers who are very sensitive to initial investments and costs. The installment payments should cover the cost of the gas stoves, the cylinders, the cylinder deposit, and the cost of expected defaults.

It should be noted that given current retail prices, there is a significant margin of about $3.5 per 5.5 kg cylinder. Even if the distribution margin were reduced, companies would still stand to make a reasonable margin over each cylinder, which justifies the use of schemes proposed above and will cover the cost of defaults.

If such a scheme to finance stoves and cylinders is to be successfully implemented, companies should be prepared to meet the challenge of supplying a large number of stoves and cylinders, when the demand occurs. For instance, to meet a sales target of increasing monthly sales of LPG by 4 to 5 tons, the company and its distributors will need to sell some 700-900 stoves. The technical and commercial staff of the company and distributors would thus need to be trained to meet this challenge.

LPG companies could themselves finance the credit scheme or explore utilizing micro-credit facilities through local banks and philanthropic institutions to finance such a scheme and minimize the impact on their cash flow.

The Aga Khan run micro-credit facility in Pemba has been making small loans to residents. These small loans are typically short-term loans (3 equal installments over a 3 month period) and residents usually take loans to finance commercial activities such as fish drying, transport, flour mill, etc. Customers have collectively taken larger loans to finance higher cost activities. In order to create a new loan portfolio, the foundation would have to cover the cost of a loan officer and related administrative costs. Preliminary discussions indicate that a minimum loan portfolio of $50,000 would be needed to justify extending the micro-credit facility to finance LPG appliances.

The use of micro-credit to stimulate the growth of SMEs should also be carefully examined. The primary reason for the low levels of income in the region is the relative absence income-generating economic activities. Micro-credit facilities could be effectively used to stimulate

entrepreneurial activities that improve the social and economic well being of individuals and consequently create a demand for goods and services.

11.1.6 Subsidies

Brazil has direct subsidy programs in place to make it easier for low-income households to purchase LPG. The subsidy program called "Auxílio Gás" (previously known as "Vale Gás") provides a subsidy of R$ 7.50 (US$ 3.00) per month, per poor family. This amount is designed to negate the difference in the market value of LPF and the price a poor family can afford to pay for LPG. This benefit is given to about 4.5 million families through a widespread program that operates in more than 5,500 municipalities in the country.

It is not the intention of this report to suggest instituting subsidies that generally tend to distort the market and frequently benefit the rich rather than the intended poor. But the option is worth considering and evaluating given the multiple benefits including environmental and health benefits of LPG. A more careful and detailed evaluation will need to be conducted before making such a recommendation.

11.2 MEDIUM-TERM STRATEGIES

If LPG companies are serious about expanding the market base and increasing demand, it has to aggressively pursue all opportunities and options and forcefully and persuasively market the ideas. Some medium term strategies that could be considered include the following.

11.2.1 LPG Distribution Network

LPG retail outlets are primarily found in urban areas (even the VidaGas filling station and retail outlet is in the urban area of Pemba) and there are almost no retailers in the peri-urban areas. This negatively impacts the demand for LPG and also fuels the negative perception that LPG is a fuel for the rich urban consumers.

It is critical that LPG companies be very visible and present in both urban and peri-urban areas of the township. Future decisions about selection of sites for LPG stores should consider the convenience of the locations to customers resident in different parts of the town.

An effective means of reaching out to target customers is to partner with local traders who have extensive experience and strategic networks in the peri-urban neighborhoods. Such partnerships can be mutually beneficial to the LPG company and the dealership. It must however be ensured that the dealers are well trained in the sales and customer service and effectively project the brand image of the company.

LPG companies should also identify and retain local spokespersons to maintain their visibility within the community. Companies could explore the idea of promoting and perhaps even subsidizing its cooking appliances to select customers who by virtue of their positions in the community – such as food vendors, local administrators, matrons, midwifes, traditional leaders, traditional healers, the local police, etc. – serve as visible spokespersons and might influence others into trying LPG.

11.2.2 LPG Company Commercial Strategy & Customer Services

To overcome the present situation where LPG companies are almost unknown entities distributing a product that customers have little knowledge of, the companies have to define and implement an aggressive commercial strategy that meets the short-term and long-term objectives and translates to achieved sales volume, market share and profit. The commercial strategy of the LPG companies have to be based on the following:

- Clear definition of its geographic operational area
- Changing its approach from a reactive attitude to a proactive marketing approach
- Adopting the approach of a company willing to grow through the continuous acquisition of new customers and their retention through regular offering of high quality product, services and technical/commercial assistance.

To make the above possible, the companies have to take the following actions:

Choose, in every market of its operational area, the right balance between a direct sales structure and a third parties sale structure to assist in the company's development.

Hire a team of qualified professionals to understand and evaluate the present situation and accordingly develop the market for LPG through multi-pronged strategies including, education and awareness campaigns, introduction of new LPG appliances for application in commercial and industrial establishments, and other promotional actions that promote the use of LPG.

Create a brand image for the company, that will become its visual identification, present in all of its installations, cylinders, vehicles, employees uniforms and dealers as well.

No attempt has been made to promote LPG as an efficient alternative fuel that can potentially replace charcoal even in relatively low-income homes. The LPG companies do not have an advertisement or marketing campaign to proactively market the product to customers, nor have they used opinion makers to mobilize the brand. The companies are reactive in their response and customers are essentially supplied LPG upon demand.

If LPG companies wish to make their presence felt in the marketplace, they need to clearly define their marketing vision and strategy and actively and aggressively promote the their business and brand.

LPG companies need to reinvent their public image from one where customers perceive them as elite, urban based companies whose prime focus is big commercial clients and rural hospitals, to one where they are seen as community based LPG suppliers whose prime concern is to uplift people's welfare through the provision of clean fuels.

The companies should have competent and well-trained staff who are capable of projecting the companies' new image in all interactions with clients whether at the filling station, retail outlet, or fuel retailer/distributor. Their service standards should be efficient and strive to prevent customers from reverting to the use of charcoal. Also, the product should be readily available even in the peri-urban areas of Pemba where it is presently less known and visible than in the very urban areas of the town.

Also, less emphasis should be placed on the sale of LPG lanterns for illumination since households that can afford to purchase LPG typically also have electricity connections (some illegally), especially since the recent induction of hydroelectric power from Cahora Bassa to households in Pemba.

11.2.3 Introduction of Smaller LPG Canisters

Given the very low income of a large proportion of the local population in Pemba, and the relatively high cost of a gas cylinder, the option of introducing smaller LPG canisters of 2.0 kg capacity was also considered. However, the analysis of cost of delivering LPG to Pemba indicates that delivered cost of LPG is very high (for instance, a 5.5 kg cylinder costs $8 to refill – about twice the price in Maputo). The additional logistics costs to acquire, fill and deliver these small canisters would make this a financially unviable option. Thus this option is not recommended.

11.2.4 Expand LPG services to other Northern Provinces

To develop the market for LPG and expand sales, LPG companies need to expand their operating territory. There is significant opportunity to expand the market beyond Cabo Delgado, to the neighboring province of Nampula and Niassa. These regions present a relatively larger demand for LPG and the increased demand has the potential to lower operational costs and hence the price of LPG, which will further stimulate demand.

LPG companies wanting to expand services to these other provinces should base their commercial operations on a mixed sales structure – partly owned by the company and operated with its own personnel, and partly owned by third parties, such as through a retailer's network.

Initially, the companies could prepare themselves to operate in the towns of Pemba, Montepuez and in the other five towns in the interior of the Cabo Delgado province and not consider sales in the rest of the province since other towns in the province present limited potential for sales.

Later, the companies could consider expanding their activities to all the towns of Nampula and Niassa provinces. These provinces have a relatively high resident population, with higher per capita income and therefore represent a larger market potential.

The companies should prepare a schedule for expansion of their service territory. Once planned, they have to prepare themselves and be ready to provide regular supply of LPG through a reliable distribution structure and deliver high quality post-sales technical support. This will inculcate confidence in the product and assuage any doubts customers may have about LPG, and will also help attract new customers. The program should serve as an instrument to promote and disseminate a "culture of LPG" among the populace.

11.3 LONG-TERM STRATEGIES

11.3.1 LPG Regulation

Mozambique has no specific legislations governing the storage, bottling, handling, distribution and use of LPG. Though the market for LPG is presently very small and may not warrant a regulatory body to monitor its supply and use, there is a need for an institutional and legal framework with the capacity to monitor and supervise the activities of the entities operating in

the sector. If the country is serious about developing its LPG market, it is critical that the LPG companies in the country work with the Government to develop rules and regulations to regulate and govern all aspects of supply and use. The development of a regulatory framework and benchmarks is fundamental to create and establish parameters of safety and product quality, covering the many steps of distribution process, as well as for customer protection.

Proper guidelines and regulations will crate the right atmosphere and provide incentives for companies operating in the country to increase their level of investment and, as a consequence, to develop the LPG market.

11.3.2 LPG Costs and Pricing

As described earlier, the delivered cost of LPG in Pemba is very high – adding about 170% to the price at Maputo. Several other cost components are then added to this resulting in customer prices that are very high. For instance, the delivered price of a 5.5 kg cylinder is almost two times that in Maputo. Despite what appears to be very high margins in the price of LPG, the low volume of sales combined with the other factors led to low revenue realization for VidaGas, a key supplier of LPG in the region.

To make LPG competitive with traditional fuels that are cheaper, there is thus an urgent need to increase sales and reduce operational costs. While all the causative factors are not under the company's control, there is an urgent need to analyze and examine operations to find opportunities to reduce costs. This is critical for a gas company that wants to transform itself into a strong commercially viable and profitable venture.

There are primarily two avenues to lower costs – 1) lower the bulk transportation costs of moving LPG from Maputo to Pemba, and; 2) expand markets to create a larger demand and hence spread fixed costs over larger volume of sales. The two approaches go hand-in-hand. This report discusses some options to lower transport costs and expand sales. It is suggested that the LPG companies along with IMOPETRO conduct detailed feasibility studies to assess the technical and financial viability of such schemes.

11.3.3 Introducing new LPG Appliances in the Marketplace

Given that electricity is still in short supply in the region, there is a tremendous opportunity to promote the use of LPG appliances in the commercial sector. LPG appliances are widely available in many parts of the world and have proven to be competitive in price and quality, especially in remote areas. This would serve to create new and increased demand for LPG. For instance, LPG companies could promote the sale of the following appliances to the commercial sector:

- LPG operated electricity generators
- LPG operated air conditioning systems
- LPG operated refrigerators and freezers (these have been introduced but are not actively marketed)

Of course, the potential for using such appliances is limited by the size of the commercial sector in Pemba and Cabo Delgado, which presently is quite small. The use of micro-credit facilities to

stimulate commercial and economic growth in the region may expand opportunities for increased use of LPG appliances.

11.3.4 Other Options

The option of a new port facility in the North to cater to the demand of the Northern Provinces and for supplying LPG to neighboring countries could also be examined. This option will become feasible only if the demand for LPG can be very substantially increased in the local markets and if the port can be used as a hub to supply LPG to other countries.

In the very long-term as the economy in Mozambique improves and incomes rise, the techno-economic feasibility of promoting the use of LPG in cars and public transport could also be studied. LPG as a dual-fuel option is an easy technical fix and is widely used in many parts of the developing world.

11.4 SUMMARY OF RECOMMENDATIONS

The table below summarizes the key barriers to increased penetration of LPG in Pemba and the strategies that could help overcome them (as described above). It is important to note that many of the barriers to increased penetration of LPG require multi-pronged actions and these actions have intertwined impacts. For instance, strategies to improve customer awareness can increase demand for LPG, which in turn will help lower distribution costs and margins and hence lower prices. Thus the strategies proposed to overcome certain barriers occur multiple times in this summary table.

Key Barriers to LPG Penetration	Strategy to Overcome Barrier	Action Required by
Customer awareness		
Short-term strategy	Consumer profiling for effective marketing	LPG company
	Awareness and education programs	LPG company, USAID/donor agency
	Promotional programs	LPG company, USAID/donor agency
High price of LPG		
Short-term strategy	Installment payments	LPG company, distributors/retailers
	Micro-credit facilities	Local banks, USAID/donor agency
	Subsidies	GoM
Medium-term strategy	Expand LPG services to other Northern Provinces to increase demand for LPG	LPG company, distributors/retailers
Long-term strategy	Lower LPB bulk transport costs and distribution costs	LPG company, IMOPETRO, GoM
	Introduce new LPG appliances in the marketplace	LPG company, Appliance retailers
	Other long-term options to reduce LPG costs	LPG company, IMOPETRO, GoM
Poorly trained LPG company human resources		
Short-term strategy	Human resource training	LPG company, USAID/donor agency

Low demand for LPG		
Short-term strategy	Consumer profiling for effective marketing	LPG company
	Awareness and education programs	LPG company, USAID/donor agency
	Promotional programs	LPG company, USAID/donor agency
	Human resource training	LPG company, USAID/donor agency
	Payment plans and micro-credit	LPG company, distributors/retailers, local banks, USAID/donor agency, GoM
Medium-term strategy	Expand LPG services to other Northern Provinces	LPG company, distributors/retailers
	Improve distribution network	LPG company, distributors/retailers
Long-term strategy	Lower LPB bulk transport costs and distribution costs	LPG company, IMOPETRO, GoM
	Introduce new LPG appliances in the marketplace	LPG company, Appliance retailers
	Other long-term options to reduce LPG costs	LPG company, IMOPETRO, GoM
Lack of commercial strategy and marketing plan		
Short-term strategy	Consumer profiling for effective marketing	LPG company
	Awareness and education programs	LPG company, USAID/donor agency
	Promotional programs	LPG company, USAID/donor agency
Medium-term strategy	Improved LPG distribution network	LPG company, distributors/retailers
	LPG company commercial strategy & customer services	LPG company
Long-term strategy	Lower LPB bulk transport costs and distribution costs	LPG company, IMOPETRO, GoM
	Introduce new LPG appliances in the marketplace	LPG company, Appliance retailers
	Other long-term options to reduce LPG costs	LPG company, IMOPETRO, GoM
Lack of regulations		
Long-term strategy	LPG rules and regulation	LPG company, IMOPETRO, GoM

Appendix 1 Mozambique Provinces and Major Towns

MOZAMBIQUE POLITICAL AND ADMINISTRATIVE DIVISION

PROVINCE	CAPITAL	OTHER TOWNS	INHABITANTS
MAPUTO			2,098,100
	MAPUTO		1,058,800
		Matola	424,662
CABO DELGADO			1,556,800
	PEMBA		84,897
		Montepuez	56,433
NIASSA			941,200
	LICHINDA		85,878
		Cuamba	57,205
NAMPULA			3,485,400
	NAMPULA		303,346
		Angoche	85,703
		Ilha de Moçambique	42,407
		Nacala-Porto	158,248
ZÁMBEZIA			3,599,900
	QUELIMANE		150,116
		Gurué	99,335
		Mocuba	124,650
TETE			1,424,300
	TETE		101,984
SOFALA			1,548,700
	BEIRA		397,368
		Dondo	71,644
MANICA			1,243,600
	CHIMOIO		171,056
		Manica	28,568
INHAMBANE			1,363,600
	INHAMBANE		52,370
		Maxixe	93,985
GAZA			1,299,500
	XAI-XAI		99,442
		Chokwe	49,730
		Chibuto	51,454

Note: The provincial population data was published by INE in 2003, and the population data for towns was reported by the demographic census of 1997. It should be noted that between 1997 and 2003, the total population of Mozambique increased 21.5%.

Appendix 2 The Cabo Delgado Province Administrative Division

DISTRICT	POPULATION	AREA Km2	INHABIT/Km2
ANCUABE	108,230	5,335	20.3
BALAMA	113,270	5,541	20.4
CHIURE	213,358	5,197	41.1
IBO	7,756	68	114.1
MACOMIA	76,379	4,123	18.5
MECUFI	37,143	1,197	31.0
MELUCO	25,573	5,875	4.4
MOCIMBOA DA PRAIA	82,550	3,494	23.6
MONTEPUEZ	166,227	17,868	9.3
MUEDA	106,786	11,233	9.5
MUIDINBE	68,918	2,195	31.4
NAMUNO	159,342	6,154	25.9
NANGADE	57,014	2,933	19.4
PALMA	50,038	3,561	14.1
PEMBA METUGE	50,936	1,757	29.0
QUISSANGA	37,699	2,027	18.6
PEMBA	108,318	106	1,021.9

Population Data on the Cabo Delgado province was published by INE in the year 2000

Appendix 3 Survey Instrument for Customer Surveys

CONSUMER QUESTIONNAIRE

A. DEMOGRAPHICS

1. Number of the interviewer _____ 2. Town_____ 3. Province_____
Area: 4. Urban_____ 5. Peri -Urban_____ 6. Local _____ 7. Questionnaire # _____

8. Gender …

	Respondent	Head of the Household
Man	1	1
Woman	2	2

9. Marital Status of …

	Respondent	Head of the Household
Single	1	1
Married/Live with partner	2	2
Divorced	3	3
Widowed	4	4

10. Age of …

Respondent	
Head of the Household	

11. No. of people living in the household? | | |
(Please fill in the exact number)

12. How many of the people living in your household are:

9 or younger	10 to 16	17 to 21	22 to 29	30 to 39	40 to 54	55 to 64	65 or more

13. Which of the following items do you have in your home?

1	2	3	4	5	6	7
Television	VCR / DVD	Radio	Computer	Landline phone	Mobile phone	Bicycle
8	9	10	11	12	13	14
Motorbike	Trolley / Wheelbarrow (to carry heavy products)	Vehicle	Toilet in side the house	Toilet outside the house	Clothes washing tank	Wooden/Iron bed
15	16	17	18	19	20	21
Mattress	Other type of beds	Paraffin Lantern	Candles	Electric Lantern	Geyser	Electric kettle
22	23	24	25	26	27	28
Electric iron	Charcoal iron	Gas cylinder (that works)	Electric stove	Gas stove	Paraffin stove	Charcoal stove
29	30	31	32	33	34	35
Firewood stove	Electric oven	Gas oven	Charcoal oven	Firewood oven	Fridge	Freezer

14. How many bedrooms are there in your house? _____

15. What is the highest level of education attained by

	Respondent	Head of the household
Basic	1	1
Secondary	2	2
Medium	3	3
High school	4	4
Other	5	5

16. What is the occupation of? (be as specific as possible)

Respondent	Head of the household

17. What is the approximate combined income of all those living in the house?

Less than 500,000 MZM	500,001 MZM and 2,500,000 MZM	2,500,001 MZM and 5,000,000 MZM	5,000,001 MZM and 7,500,000 MZM	7,500,001 and 10,00,000 MZM	More than 10,500,000.00 MZM

18. How many people work to earn this household income? ____
19. Is there pension included? ____
20. How many people live off this household income?
a. 4 or less_____ b. 5 to 7_____ c. 8 to 10____ d. More than 10____

21. What is your employment status?

Working full time	Working part time	Unemployed (looking for work)	Unemployed (not looking for work)	Retired	Student	Never worked for money

B. FUEL PURCHASE BEHAVIOUR:

1. Which of the following energy/fuel sources do you know or have heard about ***[Multiple mentions are allowed]***
a. Electricity on line ____ b. Charcoal ____ c. Firewood _____
d. Paraffin ____ e. Gas in a cylinder ____ f. Car Battery _____
g. Candles ____ f. Other _____ [specify]
[If Gas is mentioned continue, if not, then ask questions 9 and 10]

2. Which of this energy/fuel sources do you normally use in your home? ***[Multiple mentions are allowed]***
a. Electricity on line ____ b. Charcoal ____ c. Firewood _____
d. Paraffin ____ e. Gas in a cylinder ____ f. Car Battery _____
g. Candles ____ f. Other _____ [specify]

3. In your opinion, what is Gas? ***[Listen to the response and tick the appropriate answer]***
a. Very poor / no knowledge of Gas _____
b. Poor knowledge of Gas _____
c. Some knowledge of Gas _____
d. Very good knowledge of Gas _____

[If the respondent has indicates that she/he does not know about Gas, then explain briefly that gas is a type of fuel that is normally sold in different size cylinders and can be used for several domestic and industrial purposes - for example cooking, heating, illumination and refrigeration]

4. If you use gas? How often do you use it in your household?
a. Everyday ___ b. 5-6 times a week ___ c. 3-4 times a week ___
d. Once a week ___ e. Once a month ___ f. Less than once a month ___
g. Never ___

5. For what purposes do you normally use Gas in your household?
_____
_____

6. What do you like most about Gas?
_____
_____

7. What do you dislike most about Gas ?
_____
_____

8. Where do you usually fill your gas bottle?

a. At VidaGas outlets _____ b. At a shop _____

c. At petrol stations _____ d. Others (Specify) _____

[Ask questions 9 and 10 to all respondents]

9. Is it easy to find Gas in your neighborhood? Yes_____ No_____

10. Where is Gas mainly sold? _____ [type of shop, one answer only]

[Ask questions 11 and 12 to all respondents who do not use Gas]

11. Why don't you use gas in your household?

_____

_____

12. What is the likelihood of you using Gas at home if it could be obtained at affordable prices?

a. Very unlikely___ b. Quite unlikely___ c. Quite Likely ___ Very likely_____

If the answer is negative, ask:

Why is that? _____

_____

[Ask questions 13 to 24 to all respondents]

13. Please read these statements and rate your opinion according to the scale below:

a. The cost of a gas cylinder is probably:

Very Cheap_____ Quite cheap_____ Normal ____ Quite expensive _____ Very expensive_____

b. The cost of filling a bottle with gas probably:

Very Cheap _____ Quite cheap _____ Normal ____ Quite expensive _____ Very expensive _____

c. The price of a gas stove is probably

Very Cheap _____ Quite cheap _____ Normal ____ Quite expensive _____ Very expensive _____

14. In your opinion, what sum of money would be a comfortable amount to spend on all your domestic fuel needs per month?

_____

15. What is the most you would be prepared to pay for all your domestic fuel needs per month? _____

16. How often do you shop for:

	Everyday	5/6 times a week	3/4 times a week	Once/twice a week	Once/twice a month	Once a month	< 1 a month	Never
Day to day supplies	1	2	3	4	5	6	7	8
Clothing	1	2	3	4	5	6	7	8
Big shopping for the home	1	2	3	4	5	6	7	8

17. How do you get there and back when you shop for:

	How do you usually get there	How do you usually get your shopping back home
Day to day supplies		
Clothing		
Big shopping for the home		

18. What type of stove do you normally use when cooking at home? ***[Check responses on page 1, question 13]***

a. Electric stove ____ b. Gas stove _____ c. Paraffin stove _____

d. Charcoal stove ____ e. Firewood stove _____ f. Other _____ [specify]

19. How often do you use the fuels mentioned below for each task indicated?
[Check the types of fuels mentioned on page 2, question 2]

Rate each activity according to its scale.
a. Everyday ___ b. 5-6 times a week ___ c. 3-4 times a week ___
d. Once a week ___ e. Once a month ___ f. Less than once a month ___
g. Never ___

	For cooking	Heating water	Heat the house	Lighting at home	Refrigeration
Firewood					
Charcoal					
Gas					
Paraffin					
Battery Electricity					
Govt. Electricity					
Candles					
Best fuel for:					

Approximately how much does your household spend on the following fuel expenses per month*?*

a) Firewood	
b) Charcoal	
c) Gas	
d) Paraffin	

e) Electricity on line	
f) Battery Electricity	
g) Food	

21. How important are each of the following factors in your decision to buy any fuel type?

22. Which of the factors mentioned has the most influence on your decision to buy a fuel? _____ [1 to 15]

For each statement, choose one response only.

		Has no influence	Has little Influence	Has some Influence	Has a lot of Influence	Factor that has the most influence
1	Distance of traveling to get it	1	2	3	4	
2	Easy to carry	1	2	3	4	
3	Easy to store	1	2	3	4	
4	Used for different purposes	1	2	3	4	
5	Not harmful to one's health	1	2	3	4	
6	Does not harm the environment	1	2	3	4	
7	Can be paid for comfortably	1	2	3	4	
8	Is safe to use	1	2	3	4	
9	Is easy to use	1	2	3	4	
10	Is good for cooking	1	2	3	4	
11	Is good for illumination	1	2	3	4	
12	Is good for heating the house	1	2	3	4	
13	Is always available in shops	1	2	3	4	
14	Burns cleanly	1	2	3	4	
15	Is fairly priced	1	2	3	4	

23. What are your overall attitudes towards Gas when you consider the statements below: Rate as follows:
Quite poor ___ Quite good ___ Good ___ Very Good ___

		Very poor	Quite poor	Quite good	Very good
1	Distance of traveling to get it	1	2	3	4
2	Easy to carry	1	2	3	4
3	Easy to store	1	2	3	4
4	Used for different purposes	1	2	3	4
5	Not harmful to one's health	1	2	3	4
6	Does not harm the environment	1	2	3	4
7	Can be paid for comfortably	1	2	3	4
8	Is safe to use	1	2	3	4
9	Is easy to use	1	2	3	4
10	Is good for cooking	1	2	3	4
11	Is good for illumination	1	2	3	4
12	Is good for heating the house	1	2	3	4
13	Is always available in shops	1	2	3	4
14	Burns cleanly	1	2	3	4
15	Is fairly priced	1	2	3	4

24. If someone wanted to inform you about Gas, or any kind of fuel, which of the following is the best way to do sot? ***[Only one answer]***

Television Publicity	1	Other Advertising (Signs / Billboards, etc.)	4
Newspaper advertising	2	Word of mouth	5

Appendix 4Survey Instrument for Fuel Traders and Food Vendors

TRADER QUESTIONNAIRE

Interviewer: _____ Checked by_____

1 Area: _____

2. City _____

3. Type of shop/Outlet: _____

[The shop/outlet should sell some type of fuel/food to the public. If not, close the interview]

4. Which of the following products do you sell in this shop/outlet? ***[Fill the table bellow]***

Products sold in the shop/outlet	Product unit and size	* How much does it cost you to purchase this product?	How much do you sell it for?	Estimation of the monthly sales	Which of these products sells the best?
Firewood					
Charcoal					
Gas					
Paraffin					
Car Battery					
Govt. Electricity					
Govt. Electricity Credelec					
Torches					
Candles					
Batteries					
Matches					
Gas lighters					
Paraffin lighters					
Cooked food	N/A	N/A	N/A	N/A	N/A

[*If purchase price is refused, then you can get the prices by talking to the suppliers. See question 10

5. Which of the above fuels gives your business the most profit: _____

6. Is that because of:

a. Mark-up? _____

b. High sales volume _____

c. Both answers A and B _____

7. What time of the day do you usually open the shop/outlet; a. _____h_____ b. Open 24hr ____

8. What time of the day do you usually close your shop/outlet a. _____h_____ b. Open 24hr ____

9. On which days does your outlet not open to the public?

Mon____ Tue___ Wed___ Thu ___ Fri____ Sat___ Sun ___ Never (N/A) ___

[Ask all respondents. If the respondent sells Gas, skip question 20]

10. I would like to know who supplies you with the following fuels and how you get them?

11. How do you pay for these fuels?

a. Cash on delivery _____ b. Other [Please specify] _____

Type of fuel	Name of the supplier (can be a company or individual peasant vendors)	Place where fuel is obtained (usually a village name) Supplier delivers to us	We fetch it ourselves	Payment method
Firewood				
Charcoal				
Gas				
Paraffin				
Govt. Electricity				
Candles				

12. In your opinion, what is gas? ***[Pay attention to the answer and tick the appropriate response]***

a. Knows very little/ nothing about Gas _____

b. Knows a little about Gas _____

c. Knows quite a bit about Gas _____

d. Knows a lot about Gas _____

[If the respondent has indicates that she/he does not know about Gas, then explain briefly that gas is a type of fuel that is normally sold in different size cylinders and can be used for several domestic and industrial purposes - for example cooking, heating, illumination and refrigeration]

14. What do you like the most about Gas?

_____

_____

15. What do you dislike the most about Gas?

_____

_____

16. Is it easy to find Gas within the area surrounding your outlet/shop? Yes_____ No_____

17. Where is Gas usually sold? _____ [Type of shop, only one answer]

18. Do you have any storage space/place? Yes ____ No ____

18b. If yes: [Estimate the area with you steps]
Length _____ Width _____ Height _____

19. How do you feel about storing Gas on your property?
Very uneasy _____ Uneasy _____ Comfortable ____ Very comfortable _____.

19b. Why?

_____

_____

20. Would you consider selling gas to your customers if you had the opportunity to do so? ***[See question 10]***
a. Yes_____ b. No_____

20b. If not: Ask why:

_____

_____

20c. If so: Ask:
What would be necessary for you to sell Gas successful in your outlet?

_____

_____

21. What form of payment would you prefer when buying Gas for your shop/outlet?
a. Cash _____ b. Credit _____ c. Other [Please specify] _____

22. Which of the following type of fuel do you use in this outlet/shop? I don't mean the fuel you sell to your customers, but rather the fuel you use in your shop to operate your business.

23. What percent of your business expenses is made up of selling these fuels? ***[Only indicate the fuels used by the Outlet]***
01% to 25% _____ 26% to 50% _____ 51% to 75% _____ 76% to 100% _____

Type of fuels	Never	Very seldom	Seldom	Quite often	Often	Most used fuel type	Cost to you per month	% of business expenses
Firewood								
Charcoal								
Gas								
Paraffin								
Car battery (in the shop)								
Line electricity								
Candles								

[Only ask respondents who sell cooked food]

24. How much of your income comes from selling cook food to your customers?
01% to 25% _____ 26% to 50% _____ 51% to 75% _____ 76% to 100% _____

[Ask all respondents]

25. Do you offer credit terms to your customers? Yes ____ No _____?

26. If yes: How does this credit work? [Indicate briefly as set out below]
a. What type of customers gets credit: _____
b. How much credit do they get? _____
c. When must they repay the credit amount? _____

27. Considering your experience in this line of business, to what extent do the following factors influence your success in selling: _____ ***[indicate the product that sells the most in the outlet/shop]***
Only allow for one response per statement.

		Does not Influence	Influences a little	Influences	Influences a lot
1	Easy to deliver to my shop	1	2	3	4
2	Easy to carry	1	2	3	4
3	Easy to store	1	2	3	4
4	Safe to store	1	2	3	4
5	Is safe for people's health	1	2	3	4
6	Doesn't damage the environment	1	2	3	4
7	Can be paid for comfortably	1	2	3	4
8	Safe to use	1	2	3	4
9	Easy to use	1	2	3	4
10	Good for cooking	1	2	3	4
11	Good for lighting	1	2	3	4

		Does not Influence	Influences a little	Influences	Influences a lot
12	Good for heating the house	1	2	3	4
13	Always available in stores	1	2	3	4
14	Is a clean source of fuel	1	2	3	4
15	Is the best source of fuel for the success of my business				

28. Which of the above factors is the most important for the success of your business? _____[1 to 15]

29. Looking at the statements in the table below, what are your attitudes towards Gas when you think of the following aspects related to its purchase for use in your shop/outlet? Rate them as follows?

Not Favorable ___ Less Favorable ___ Favorable ___ Very Favorable ___

		Not Favorable	Less Favorable	Favorable	Very Favorable
1	Easy to deliver to my shop	1	2	3	4
2	Easy to carry	1	2	3	4
3	Easy to store	1	2	3	4
4	Safe to store	1	2	3	4
5	Is safe for people's health	1	2	3	4
6	Does not damage the environment	1	2	3	4
7	Can be paid for comfortably	1	2	3	4
8	Safe to use	1	2	3	4
9	Easy to use	1	2	3	4
10	Good for cooking	1	2	3	4
11	Good for lighting	1	2	3	4
12	Good for heating the house	1	2	3	4
13	Always available in stores	1	2	3	4
14	Is a clean source of fuel	1	2	3	4
15	Is the best source of fuel for the success of my business				

30. Please read these statements and rate your opinion according to the scale below:

a. The cost of gas equipment is probably:

a. Very cheap ____ b. Cheap _____

c. Expensive ____ d. Very expensive _____

b. If you knew it would save your money in the long run, would you be happy to buy equipment that runs on gas (for example the gas cylinder, gas stove, gas freezer, gas candles, etc)::

a. Very unlikely ____ b. Unlikely _____

c. Quite Likely ____ d. Very likely _____

Appendix 5 Calculation of Freight Charges to Transport LPG by Tanker-truck from Maputo to Pemba

Option 1: Two round trip per month with two drivers
Option 2: One and half round trip per month with one driver
Option 3: One and half round trip per month with two drivers

Description	Unit	Option 1	Option 2	Option 3
Investment	US$	120,000	120,000	120,000
Depreciation (60months)	US$/month	**2,000**	**2,000**	**2,000**
Km/month	Km/month	11,000	8,250	8,250
Diesel	Liters/month	3,500	2,625	2,625
Diesel price	US$/liter	0.75	0.75	0,75
Total expenses with diesel	US$/month	**2,625**	**1,970**	**1,970**
Salary of two drivers	US$/month	**1,000**	**500**	**1,000**
Trip expenses	US$/month	**800**	**400**	**800**
Maintenance	US$/month	**500**	**500**	**500**
Tires, lubes, etc	US$/month	**500**	**500**	**500**
Total cost	US$/month	7,425	5,870	6,770
Tons transported	Ton/month	40	30	30
Unit transport cost	US$/ton	**186**	**196**	**226**

Appendix 6Proposed Commercial Structure for LPG Companies to Operate in Other Towns and Provinces

In the first stage of developing a new commercial structure, the LPG company should be organized as follows in different markets in Cabo Delgado province.

Pemba: It is the capital of the Cabo Delgado province, with a population that has a relatively higher level of education and income.

The sales structure should be directly operated by company's employees. The company should put in place a call center to receive customers requests and plan LPG deliveries. The call center should be located at the company's filling center, where a direct retail sale shop should also be located. LPG deliveries should be made using the company's own distribution fleet.

Montepuez: It is the second largest town in Cabo Delgado province. The population is defined by a close-knit social structure.

Outsourcing sales will probably be the best choice. The chosen retailer (dealer) should have strong links to prominent residents of the town, which will help the dealer influence the population in the decision to use LPG use for cooking, as well as in the selection of brand to be used.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one or two small trucks with 50-60 cylinder capacity to deliver products to customers.

Other small towns in the province: These are towns with strong tribal social structures.

The sales structure should necessarily be outsourced and operated by select and exclusive dealers in each town who have strong linkages with the local populace.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one small truck with 30 cylinder capacity to deliver products to customers. In the smaller towns, the possibility of using modified motorcycles or other low-cost means of transportation to deliver cylinder should also be considered to reduce costs.

In the second stage of developing a new commercial structure, the company should be organized as follows in other Northern provinces and towns.

Nampula: It is the capital of the Nampula province, with a population with a population that has a relatively higher level of education and income.

The sales structure should be directly operated by company's employees. The company should build a small depot, which can stock a week's supply and also have a direct sales shop at the depot. The company should put in place a call center at the depot to receive customers requests and plan LPG deliveries. LPG should be made using the company's own distribution fleet.

Angoche: a large town in Nampula province. The population is defined by a close-knit social structure.

Outsourcing sales will probably be the best choice. The chosen retailer (dealer) should have strong links to prominent residents of the town, which will help the dealer influence the population in the decision to use LPG use for cooking, as well as in the selection of brand to be used.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one or two small trucks with 50-60 cylinder capacity to deliver products to customers.

Ilha de Mozambique: a large town in Nampula province. The population is defined by a close-knit social structure.

Outsourcing sales will probably be the best choice. The chosen retailer (dealer) should have strong links to prominent residents of the town, which will help the dealer influence the population in the decision to use LPG use for cooking, as well as in the selection of brand to be used.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one or two small trucks with 50-60 cylinder capacity to deliver products to customers.

Nacala-Porto: Second largest town of the Nampula province and important harbor in Mozambique. The population has a relatively higher level of education and income.

The sales structure should be directly operated by company's employees. The company should build a small depot, which can stock a week's supply and also have a direct sales shop at the depot. The company should put in place a call center at the depot to receive customers requests and plan LPG deliveries. LPG should be made using the company's own distribution fleet.

Lichinda: Capital of the Niassa province. Despite being a provincial capital city, it is a small town in the inland areas.

Outsourcing sales will probably be the best choice. The chosen retailer (dealer) should have strong links to prominent residents of the town, which will help the dealer influence the population in the decision to use LPG use for cooking, as well as in the selection of brand to be used.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one or two small trucks with 50-60 cylinder capacity to deliver products to customers.

Cuamba: Second largest town in Niassa province. It is a small town in the inland areas with a close-knit social structure.

Outsourcing sales will probably be the best choice. The chosen retailer (dealer) should have strong links to prominent residents of the town, which will help the dealer influence the population in the decision to use LPG use for cooking, as well as in the selection of brand to be used.

The retailer should build a small depot, which can stock a week's supply and also have a direct sales shop. The retailer should also own one or two small trucks with 50-60 cylinder capacity to deliver products to customers.

Appendix 7 Economic Benefits for a LPG Dealer/Retailer

Economic Benefits For 1,000 5.5kg Cylinders Per Month Sales Operation

An investment of US$ 4,000 in a depot able to store 250 cylinders, to be depreciated over a 10-year period.

An Investment of US$ 3,000 in a motorbike for local distribution of LPG cylinders, to be depreciated over a 5-year period.

The retail depot will need to employ a total of three employees. One of them will be the motorbike driver for local deliveries.

Assume that local deliveries will represent 50% of total sales, or 500 cylinders/month, equivalent to 20 cylinders for each motorbike's working day.

1	**Total Sales**	**Tons**	**5.5**
2	5.5 Kg cylinders sold	N°	1,000
3	Sales at the depot gate	%	50%
4	Sales at the customer premises	%	50%
5	Total earnings from LPG	US$	5,500.00
6	Home delivery surcharge = 10%	US$	275.00
7	**Total earnings/month**	**US$**	**5,775.00**
8	LPG cost	US$	4,647.50
9	Depreciation	US$	83.33
10	Personnel costs	US$	300.00
11	Fuel	US$	125.00
12	Maintenance	US$	50.00
13	Telephone	US$	100.00
14	Other expenses	US$	200.00
15	**Total expenses**	**US$**	**5,405.83**
16	**Net economic benefit/month**	**US$**	**269.17**

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel: (202) 712-0000
Fax: (202) 216-3524
www.usaid.gov